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WORLD TRADE AND THE PETROLEUM INDUSTRY

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SUBCOMMITTEE ON ECONOMIC GOALS AND INTERGOVERNMENTAL POLICY

OF THE

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WORLD TRADE AND THE PETROLEUM INDUSTRY

THURSDAY, APRIL 18, 1985

CONGRESS OF THE UNITED STATES, SUBCOMMITTEE ON ECONOMIC GOALS AND INTERGOVERNMENTAL POLICY OF THE JOINT ECONOMIC COMMITTEE,

Washington, DC.

The subcommittee met, pursuant to notice, at 10 a.m., in room SD-538, Dirksen Senate Office Building, Hon. Lloyd Bentsen (vice chairman of the subcommittee) presiding.

Present: Senator Bentsen and Representative Fiedler.

Also present: George R. Tyler and John Starrels, professional staff members.

OPENING STATEMENT OF SENATOR BENTSEN, VICE CHAIRMAN

Senator BENTSEN. Welcome, ladies and gentlemen, to this third Joint Economic Committee hearing devoted to U.S. trade policy. I think it's particularly pertinent that we have it today because we have new figures this morning on the annualized GNP growth for the United States. The administration projected that we would have approximately 4 percent growth in the GNP this year. The flash figure we had in February for the first quarter was 2.1 percent, barely one-half the projection. The figure that we have just seen this morning is 1.3 percent, a further and very substantial reduction.

Most of that drop in economic growth has come about from the flood of imports into the country. Last year we had a $123 billion trade deficit, almost double the preceding year. This year it's projected that we will have about a $160 billion trade deficit and our eroding trade position has contributed materially to the slowing now underway in GNP growth.

Our two earlier hearings found that administration trade policy has failed to stem the rising tide of protectionism abroad and it has forced U.S. farmers and manufacturers to compete unfairly with subidized competitors abroad who hide behind illegal trade barriers.

At today's hearing we will examine the impact of trade policy on our refining and petrochemical industries, and on the oil-dependent Texas gulf coast. That's an area particularly hard hit by imported products from State-owned and subsidized OPEC refineries.

Despite the recovery elsewhere, refineries are staring depression in the face. The number of refiners has fallen by one-third—by 106—since 1980. And the rest are operating well below capacity.

The price they charge is set in places like Lagos and Kuwait, and has fallen steadily. Wholesale gasoline costing $1.04 per gallon in 1981 now sells for 75 cents.

That has helped check inflation, but it has gutted domestic earnings of gasoline refiners. The 12 largest refining companies, for example, suffered a 60-percent drop in earnings last year and they face more declines ahead.

Petrochemical producers are also under the gun, because U.S. imports are soaring from foreign competitors receiving illegal underpriced energy from OPEC nations. The number of ammonia plants is down 40 percent since 1978, for example, due to a flood of such imports. And the Chemical Manufacturers Association reports the loss of 43,000 jobs since then due to soaring imports. Ammonia and urea imports this year will be double what they were in 1981 and methanol imports will be up an estimated sevenfold.

The major factor responsible for the grim refining and petrochemical outlook is the emergence of major new capacity in OPEC. This capacity is State controlled. This new capacity is backed by OPEC and is ready, willing, and able to undercut current U.S. producers in order to gain marketing toeholds. And once they have established their market share, the demise of many U.S. plants in this country, is sure to follow.

I flew over the Persian Gulf some years ago, and witnessed the flaring of Middle Eastern gas at night. It looked like thousands of campfires spread across the desert. But now they are putting that feedstock to work by heavily subsidizing the construction and operation of new facilities to convert it to exportable products. They are providing crude oil, for example, to the refineries at least $2.50 per barrel below world prices—and I had the head of one U.S. company tell me it was at least $3.50 yesterday—just to earn hard dollars from exports. In an extreme case, the Indonesians' methanol plant on Bunyu Island uses free government-owned gas as a feedstock. Even so, overhead and debt servicing costs run to 61 cents per gallon for methanol that sells for 37 cents in Houston.

This new capacity enters a world already glutted with excess capacity. Amoco has estimated that 12 million barrels a day or 20 percent of refining capacity now is idle. Demand is expected to grow only 600,000 barrels a year. Yet, OPEC nations with 5.1 million barrels of refining capacity already on line now are adding a further 2.5 million barrels of capacity.

Most of this expansion is occurring in the Middle East and Africa where refining capacity over the next 2 years will rise 45 percent. In 1987, world petroleum demand is projected to be 3 million barrels a day below 1979 demand. Yet, these particular OPEC nations will have more than doubled their refining capacity to 4.1 million barrels per day over the same period. Adding new capacity under such conditions defies universal economic logic.

Reaction to this glut in other nations has been to limit imports. Japan, for example, permits no gasoline or middle distillate to enter. Countries as diverse as Italy and Sweden are imposing quotas on OPEC oil products.

But the United States market is almost wide open. And areas like the gulf coast are paying dearly for that as well as for past over-capacity. The energy industry—from rig construction and off-

shore services to petrochemicals and refining—forms the industrial heart of that region. And employment has fallen sharply all along the gulf coast. Data from the John Gray Institute at Lamar University is being released today at this hearing which vividly portrays the employment impact of these illegal OPEC imports and a soft energy market generally.

In the Beaumont-Port Arthur area in 1980, there were 38,500 people at work in the manufacturing sector. By 1984, it had dropped by 8,000, or over 20 percent. Houston dropped almost 18 percent. Along the entire gulf coast, we have lost about 54,000 workers in jobs related to the petroleum industry since 1980.

Now that kind of a disastrous situation stands in sharp contrast to the recovery that has taken place in many other regions of our Nation. And remember, this is happening at a time when we've seen real growth in the United States overall.

Our witnesses today will discuss the state of our petroleum industry and foreign trade, and particularly its effect on the Golden Triangle region of Texas. The first witness we have is my very distinguished colleague and my very good friend, a tough and able, Congressman representing the Golden Triangle, my friend Congressman Jack Brooks.

STATEMENT OF HON. JACK BROOKS, A U.S. REPRESENTATIVE IN CONGRESS FROM THE NINTH CONGRESSIONAL DISTRICT OF THE STATE OF TEXAS

Representative BROOKS. Thank you very much, Senator, and may I first commend you on having this hearing pinpointing the problem in the Golden Triangle, yes, but reflecting an overall malaise for the entire Nation's economy which you so ably outlined in your overview in your opening statement. It is significant to every manufacturing entity in the United States and this is just an example of what's happening all over this Nation. I am delighted that you are putting this hearing together facing that problem as you have, and the only thing that really disturbed me is that I had not heard the horrible figure of $160 billion trade deficit for this coming year. I knew the $123 billion for last year but I hadn't heard the estimate of $160 which is 160 billion dollars' worth of jobs and profits that this Nation is exporting abroad—our jobs, our profits.

It affects not only people that work for a living. It affects all the people that are trying to make money out of it and get rich and pay off their investments. I would like to thank you for the opportunity to come over here and testify on how it looks between the relationship between the foreign suppliers and domestic petroleum industry, especially as it affects our Golden Triangle area, which I have represented for the last 32 years.

It's heartening that the subcommittee is focusing on this problem and this region, both of which have seen major detrimental changes in the last few years.

Senator, at the beginning of the 1980's, Money magazine chose Beaumont, TX, as the best American city in which to work and live and raise a family, and yet today that same area is one of the most economically deprived within the State. Business enterprises, both large and small, have closed. The tax base has eroded. Hundreds of

homes are up for sale. In January, the unemployment rate for the Golden Triangle averaged 13 percent, while Port Arthur alone had a 19-percent rate.

While a variety of factors have certainly contributed to this sudden and dramatic reversal of fortunes, nearly any worker from the area can tell you that the major reason for the current problems facing Beaumont, Port Arthur, and Orange is the decline of the petroleum industry. The drop in production and the cutbacks by refiners in the petrochemical plants in the area, largely built on oil, has been a hard blow and were it not for the determined efforts of the citizens and community leaders in these cities to find new industries to employ the thousands that have been thrown out of work over the last 4 years, the situation would be far worse.

However, Senator, I'm not here today just to bemoan the hardships faced by the Golden Triangle because I have great faith in the ability of our southeast Texans to overcome hardships and to support Lloyd Bentsen.

Senator BENTSEN. You got my attention.

Representative BROOKS. Still the Nation and this Congress should take special note of the situation as it has developed in our region because it serves as an excellent case in point for what the Nation as a whole—it says may face—I say will face and are facing unless actions are taken to help preserve the domestic petroleum industry.

According to the Department of Energy, between 1981 and 1984, some 127 domestic refineries nationwide closed down resulting in a loss of nearly 4 million barrels per day in refining capacity. During the same period, Texas alone lost nearly 1.4 million barrels of capacity, over 3,000 refining jobs, with an additional 2,000 jobs estimated lost just within the last year.

But it's not just refining jobs that are gone, as we have seen in the Golden Triangle. Other industries related to petroleum refining have also had to curtail operations. Those jobs, those families have been affected. And I'm not going to list them all. You know there are shipping people—you want to buy a barge, want to buy a tugboat, a push boat? They've got them stacked up between New Orleans and Houston. But I'm saying that if this trend continues—and most experts don t see any end to it—Texas and the Nation will face a major economic disaster in the coming years.

It's not my intention to detail the reasons for the changes. This committee, as well as others in Congress, are already investigating the events that have led to our present situation and you all have been doing an outstanding job of that. Many factors, including inefficient management, outmoded facilities and Government policies, may be blamed for the downfall of any one refinery, but I agree with those who state that one prime contributor to the tremendous loss of refining capacity has been unfair foreign competition. And I believe this is one aspect that we in Congress must take a hard look at.

Since the early 1970's, we in the United States have been aware of the vulnerability of depending on foreign crude supplies and while our Nation and our allies have taken measures of sacrifice to lessen the impact of future disruptions of crude supplies, we still remain open to severe economic adversities should another sus-

tained oil embargo be imposed. Yet, as grim as this prospect may be, the actions of these foreign suppliers over the last few years in developing their own refining operations poses an even greater threat to America and its allies because these foreign suppliers control their own source of crude and can generally set their own domestic prices at whatever level they wish. They can also achieve artificially low production costs for their refined products.

Our free market economy, our willingness or perhaps our stupidity to allow free trade both encouraged the foreign refiner to dump these products in U.S. markets. As a result, our domestic refiners are unable to compete against these artificially cheap products, no matter how efficient the refining operation is, how great the supply of domestic crude, the independent refiners in the United States, most of whom must pay current market prices for crude—they pay the spot prices—have borne the brunt of the unfair competition from foreign refined products thus far. But many feel that the major oil companies with tremendous reserves of their own will soon face the same difficulties. Their in-the-ground costs might be $12, $14, $15, but in the OPEC nations they can allocate their crude supplies at $2 if they want to. They have worked and forced out most of the independent refineries and they are going to go to work on the majors next.

Our Nation may well see many more refineries closed. The consequences on the United States could leave us with either inadequate crude supplies or inadequate refining capacity during another petroleum disruption are really just not hard to imagine. Not only our economic livelihood will be jeopardized, but the very security of this Nation in any emergency would be at stake. We would not have operating the refining capacity to provide the products we need for defense. It wouldn't be available. It wouldn't be onstream. It would have to be retooled up.

Senator, I believe that we should continue with and strengthen those programs which we developed since the Arab oil embargo to help ensure the Nation's independence from foreign crude supplies and these include the maintenance of an adequate strategic petroleum reserve, already in trouble under this administration's current budget proposals, the development of new sources of supplies, efforts to conserve energy. At the same time, however, I would urge this committee to explore every reasonable alternative to helping correct the potential shortfall in domestic refining capacity. The Golden Triangle has been hard hit, but with a great deal of hard work and determination we in southeast Texas will continue to overcome the devastating effects of the abrupt decline of the petroleum industry which we've seen in our region. But for the Nation as a whole, it would be better if we had never had to face similar dire consequences at all.

Again, Senator, I want to thank you for the gracious opportunity you have extended to me to appear before you and please know that I stand ready to be of further assistance in helping find a solution to this critical problem. Thank you, sir.

Senator BENTSEN. No one has ever had any question about where Jack Brooks stood on an issue. You have spoken with clarity and force and I know you to be one of the most influential Members of the Congress. Your comments will carry a great deal of weight. No

Member relates more to the concerns of their congressional district than you, and I appreciate your contribution this morning.

We would be delighted to have you stay. I have no questions because I find myself so much in agreement.

Representative BROOKS. Let me add one thing, Senator. I have always been for free trade. I believe in free trade. But it ought to be just as free for us as it is for them. That's the simple fact about it.

Senator BENTSEN. I agree. I've been known as a free trader all my life and I still am. But it looks like some of these other people, instead of free trade, they just want a free hand.

Representative BROOKS. A free hand, heads I win, tails you lose.

Senator BENTSEN. The other day I heard about a cowboy who was told by a doctor he only had 6 months to live. He decided he wanted a second opinion and he found himself another doctor and the doctor said, "Well, I'll tell you what to do. You go out and find the meanest wild horse you can find and try to break her to the saddle. And the second thing you do is you go out and buy yourself a refinery on the gulf coast." The fellow replied to the doctor, "You mean that's going to cure me?" He said, "No, but it will be the longest 6 months you have ever lived." [Laughter.]

Representative BROOKS. Thank you, Senator.

Senator BENTSEN. Thank you very much.

We are fortunate to have Judge Thomas of the 172d District Court who is not only an outstanding jurist but a man who does a great deal of pro bona work and is a civic leader in the Golden Triangle, as our next witness.

STATEMENT OF HON. THOMAS A. THOMAS, STATE DISTRICT JUDGE, JEFFERSON COUNTY, TX

Judge THOMAS. Thank you, Senator.

As you've mentioned, my name is Thomas A. Thomas. I am a State district judge and a resident of Port Arthur, TX, located in the Golden Triangle of our State and recognized as having one of the largest concentrations of petroleum refineries and petrochemical plants in our Nation.

We from the gulf coast area of Texas want to first commend you for holding this series of hearings on U.S. trade policy, and especially for your continued deep interest in the concerns of our region. We Texans are extremely fortunate to have a senior Senator who not only is ranking Democrat on the Joint Economic Committee, but also who is so highly recognized among his colleagues as to be named head of the Senate Working Group on Trade Policy and ranking Democrat on the Finance Committee's Trade Committee.

I would like to share some personal observations with you in a general sense and defer to Mr. Tell, Mr. Weinstein, Mr. Sheppard, and Mr. Melaas for a more specific recitation of the consequences of the petroleum importations and specific suggestions that will be beneficial to our petroleum industry.

We have become painfully aware that the industries which have been the life blood of our area are in a serious economic struggle for survival. We have observed that our refineries not only have re-

duced production but in some instances have shut down production departments which resulted in substantial permanent loss of jobs. We have learned that these changes in operations are not attributable to old or inefficient refineries but rather are directly related to the importation of foreign petroleum and products. The problem is so severe that industry, labor, and community leaders are all in agreement that our National Government, through its executive and congressional leadership, must act and act now to save this industry which is crucial to our national security and to our economy.

We have been hearing in recent months from petroleum experts that our Government must establish a national energy policy. We have been hearing complaints from management and labor of many of our industries such as textiles, automobiles, and steel who have been victimized by foreign exporters who, having easy access to our markets, have unloaded their government-subsidized products.

Now it is the petroleum industry that is under attack and we are all here together to tell you that we have a serious problem and we desperately need your help. We hope that our Government will implement a fair trade policy that will permit our industries to compete with our trading partners in the marketplace on an equal basis.

Discriminatory trade practices against American exports have existed for years. We have seen key industries unable to compete in the marketing of their products and the resulting elimination of thousands of jobs for our workers. The question has to be asked, "Why has our Government permitted this to happen and why are we the only country practicing free trade while all of our trading partners do otherwise?"

As our local governments and their citizens assume an additional financial burden to help our industries survive by cutting taxes and making other concessions, their anger will necessarily be reflected in demanding a solution to this problem. This is not only an economic issue; it is also very important politically. It is inescapable that this issue will be in the forefront of the 1986 congressional elections unless Congress and the executive branch meet this problem head on and enact an energy and trade policy this year that protects not only the petroleum industry but our other industries in this country.

Thank you for the opportunity to let me share these thoughts with you.

[An attachment to Judge Thomas' statement follows:]

REMARKS OF CONSTANTINE S. NICANDROS, PRESIDENT, PETROLEUM OPERATIONS, CONOCO, INC., BEFORE THE BEAUMONT ROTARY CLUB, BEAUMONT, TX, APRIL 3, 1985

COMPETING IN THE WORLD MARKET

Good afternoon. Thank you, Dave (Willette).

One thing that is quite clear to anyone looking around this community and the Golden Triangle in general is that oil is an important factor to the economy here. The pumping units, refineries and petrochemical complexes are evidence of this. And so it has been since the first refinery in Texas opened here in 1896 and the first oil gusher was struck in 1901.

Following the turn of the century, the industry set out on a path of growth spreading along the Gulf Coast that at times seemed never-ending. But as I'm sure most of you recognize, times have changed.

To examine what these changes have meant to Beaumont and its Gulf Coast neighbors, I'd like to briefly look back a few years to set the stage. Then, I'd like to discuss where the petroleum and petrochemical industry is today and what our major challenges are. And finally, I'll tell you what I believe must be done to keep this industry healthy and to allow individual companies to survive.

Let me begin by noting that 10 years ago and then again about five years ago, the major topics of discussion were energy shortages and the soaring prices of oil, natural gas, petroleum products and petrochemicals. This state of affairs was brought on by a tight crude oil supply/demand environment and our overdependence on the Middle East for a large part of our requirements. Also contributing was a maze of controls and regulations put in place by our own government that encouraged consumption, discouraged efficient petroleum supply and kept the market from working the way it should.

It was a time of distorted signals for supply, demand and price that stimulated huge investments in petroleum and related industries. Unfortunately, not all the investment was of the right kind. For example, a good deal of inefficient refining capacity was built to take advantage of the government's entitlements program. This investment is doing little or no good today; the investors in many of these facilities didn't come out so well, either. In addition, many new companies were formed to cash in on the rush for "new" oil development. This in turn prompted the expansion of the many oilfield service companies that are now suffering through the inevitable cut-backs as they return to a more realistic operating level.

The high prices for petroleum had a predictable effect. Although slow to evolve, demand did finally drop, and new sources of supply were developed.

Now, compared to the 1970's, we have a complete market reversal for petroleum. The byword today is oversupply. You know what oversupply has done to the petroleum business -- it has hurt us in exploration and production, in refining and marketing, and in important related businesses such as petrochemicals. The effects have hit us hard in Houston, and you are seeing the same effects right here in Beaumont. The days are gone when a steady growth of the industry pulls along all competitors -- the inefficient as well as the efficient.

Let me now get down to some specifics about conditions facing the industry, Beaumont, and other petroleum-oriented cities along the Gulf Coast. Three concerns stand out in my mind.

The first concern is that crude oil imports are rising again. Since the late 70's, when imports were running at around six and a half million barrels daily, the nation's dependence on foreign suppliers declined steadily through 1983, when imports averaged 3.1 million barrels daily. In 1984 imports rose slightly and are now expected to reach three and a half million barrels daily by the end of this year. By a decade from now, projections are that the U.S. will be roughly at the same level of import dependence we experienced in the 70's -- about 40%. Some level of imports is of course unavoidable, but I would suggest that this trend does not bode well for our future ability to withstand the fluctuations that can flare up at times in the international market.

Why are imports rising? The answer is: oil companies simply don't have adequate incentive to go out and crank up their exploration and production programs.

Part of the reason for this is that the OPEC countries have so far been unable to fine-tune world supply to demand, leading to a perception in the market that there is an oversupply of crude oil. This has eroded the price in the last few years, which makes it harder for companies to justify the investment needed to find and develop new reserves.

Our own government contributes to the problem with well-intentioned policies that set aside promising exploratory acreage from fear of possible environmental damage. In addition, the Interior Department's proposed 5-year offshore leasing plan will slow down the rate at which new exploratory areas will be offered for sale. This reflects in part the industry's slow-down in drilling activity caused by the recent drop in crude oil prices. It appears that the plan will not have a negative near-term effect on the Gulf of Mexico. However, we do not welcome any change such as this that delays the timing of potential lease sales for any offshore area.

Finally, there is the disincentive of the tax burden on the oil industry, which already is taxed at almost twice the rate of other industries. Increases in tax rates, which seem to be a perpetual threat to oil companies, can make a big difference in analyzing the rewards and risks of a particular project, and

consequently in determining how much resource development gets done.

My second concern is the lingering overcapacity of the U.S. refining industry. In the late 70's petroleum demand was expected to continue to grow at a steady clip for many years to come. Some "teakettle" refineries were constructed or expanded to meet this demand, which of course never materialized.

Since then, nationwide, over 150 refineries have been shut down. A capacity of well over 18 million barrels daily has been whittled away to around 15 million barrels daily. But since 1985 industry crude runs are forecast to be only slightly above 12 million barrels daily, you can see that we are still operating at only around 80% of capacity. We must expect that the shake-out in refining is not over, since the permanently restrained growth in demand will not be enough to use the excess capacity that still remains.

Compounding the problem for our domestic refining industry is a disturbing increase in the imports of refined products from other countries.

My third concern deals with weak profits in the petrochemical industry, caused in large part by rising imports. Foreign competitors are in a strong growth phase right now, with new plants coming onstream in the Middle East, Canada, Mexico and

Japan. These are typically plants with state-of-the-art technology, and they sometimes benefit from extremely low feedstock costs, as in the Middle East, where natural gas has little or no alternate value. They represent formidable competition, and will add perhaps 10% to world petrochemical production capacity in the very near future.

Currently adding to the competitive pressure that such new capacity puts on U.S. producers is the remarkable strength of the dollar in recent years.

The crippling impact of the strong dollar on local petrochemical manufacturers is direct. It lowers the price of imported petrochemicals, which domestic plants must compete against. But there's also an indirect impact. When foreign manufactured goods -- such as cars and textiles -- are made more price-competitive in the U.S., it is at the expense of domestic industries that use raw materials made by U.S. petrochemical plants.

The strong dollar, of course, is only one factor that contributes to the U.S. trade deficit, but all factors taken together in 1984 produced a deficit of $125 billion -- more than triple the deficit in 1982.

The net result is that a disturbing number of American jobs are lost, many in the basic industries such as those on which Beaumont depends. A good many of these jobs may never be regained.

Let me give you a couple of examples of how Du Pont plants have been affected, and what this means to the Golden Triangle area.

Last year, chiefly due to the strong dollar, textile imports increased by one-third, despite essentially flat demand. Under this flood of imported competition, Du Pont discovered that even one of its highly efficient and modern textile facilities in South Carolina could not compete. Product output had to be curtailed, and 400 permanent jobs were lost. Thus an important customer for petrochemical products cut back on its orders. This certainly had implications for the petrochemical industry in this area.

The second example is right here in Beaumont. Most of you are probably familiar with last year's closure of Du Pont's methanol facility due to oversupply and falling prices. This led to the loss of 140 jobs.

To repeat, then, I see three major concerns facing us:

- Rising imports of crude due to inadequate development incentives here at home.

- Continuing refinery overcapacity and rising imports of petroleum products.

- And the difficult situation of our petrochemical industry.

Let me now turn to what I think are some useful steps to take to deal with these problems.

I'll preface these remarks with a comment about the basics of the petroleum environment I see in the future. In short, I expect the situation in regard to oil supply, demand and price to continue pretty much as it is now through the rest of the 1980's, even though there is likely to be considerable volatility in prices for short-term periods.

The problem of inadequate incentives for finding and developing domestic petroleum, and the increase in imports which goes with it, will remain fundamentally a market problem. As long as the values of refined products, crude oil, and natural gas are low, and after-tax returns are also low, companies are naturally going to limit the new capital investments they make. Until times get better, and I think they will, we in the industry have a right to expect that government actions would not make matters worse. But I fear this will occur if the U.S. Congress decides to raise taxes on business in general and the oil industry in particular, which might well happen as part of an effort to reduce the budget deficit. I believe the deficit should be reduced, but this is not the way to do it.

The Treasury Department's latest tax proposals -- while revenue-neutral as a whole -- are not revenue-neutral for business.

They would increase business taxes by about 25 percent initially, with the added burden rising to nearly 40 percent by the end of the 80's. This is a reversal of previous Administration policy, which was to encourage business investment through tax incentives.

The Treasury's proposal, among other things, would eliminate the tax incentives related to intangible drilling and development costs. And they would deny small producers the incentive of the percentage depletion allowance, which has already been eliminated for larger producers.

It is also disturbing to see the Department openly acknowledge that these actions probably would reduce domestic production and increase American dependence on foreign sources of oil.

There will be a lot of opposition to the Treasury plan, from business and from some legislators in the oil-producing states. But the Treasury blueprint is a populist approach, with considerable bipartisan support. Therefore, if the President does get behind the plan, it has a chance of passage in some form.

In addressing what to do about the problem of refinery overcapacity, I believe we must all recognize that additional closures of marginal capacity along the Gulf Coast are virtually inevitable. On the whole, the nation's refinery

complex in this area is among the most efficient in the world, but nevertheless there simply is not enough demand in the marketplace to keep all of these facilities in full operation.

As far as product imports are concerned, there are some specific customs actions that can and should be taken to ensure that the U.S. refiner has the opportunity to compete in a setting of free and fair trade.

For example, a blendstock that is almost gasoline is dutied at one-fourth of a cent per gallon, whereas the duty on finished gasoline is a cent and a fourth per gallon. In today's market, that is a significant cost advantage to the blendstock, which quickly enters the market as finished gasoline, competing with U.S. refined product.

Requiring a more equitable duty for imported blendstocks is a simple example of how the government can close a loophole that is giving foreign suppliers an unfair advantage.

The competitive problems facing the petrochemical industry at least match those of the refining industry in complexity. The facts of life are that a formidable new group of competitors is emerging overseas; their impact on world markets is likely to be felt for many years into the future.

The likelihood is that even if demand picks up and there is an easing-off of the value of the dollar, only the most innovative

and efficient petrochemical producers are likely to survive.

As a matter of fact, the challenge that this represents to petrochemical companies is equally applicable to other oil-based industries -- refining, exploration and production, transportation, you name it. High productivity and the ability to compete effectively: these are today's key concepts.

At Conoco and Du Pont, we are redoubling our efforts to be productive and competitive against all comers, domestic and foreign. This means pruning some branches of our business to make them more competitive and closing down operations that cannot be made profitable.

Throughout the company, a tremendous effort is being made to increase efficiency and productivity. A major cost reduction effort even applies to our high level of activity in exploration and development. This is our life's blood, of course, and we are maintaining our commitment to it, but we are determined to achieve more with less.

- This means developing new technology, such as our floating production platform -- the tension leg platform -- to more economically develop deep-water prospects. This will have direct application to the growing level of activity in the Gulf of Mexico.

- It means bargaining hard with governments to reduce royalties and other costs.

- It means demanding full value from our suppliers and contractors.

- And it means holding down our own labor costs, in both blue and white collar jobs.

In fact, we are reorganizing and reducing our work force from top to bottom. A new company-wide early retirement program is one aspect of this effort to reduce labor costs, and initial indications are that it will be highly successful.

Finally, let me leave you with these thoughts in terms of the market competition as it applies to this area. Beaumont is not just competing with Port Arthur for business and jobs. It's not just competing with the rest of Texas or the rest of the nation. In petroleum products and petrochemicals, it's competing with Saudi Arabia and Kuwait; indirectly, through man-made fibers, it's competing with Taiwan and Hong Kong; and, in the fabrication of offshore rigs, it's competing with Asia and Europe.

In this competition, there is a shared responsibility. We are all in this boat together. Management must make the most

efficient use of capital and all the resources at its disposal. It must make tough decisions about where to invest and where to divest. Labor's responsibility is to cooperate in improving efficiency and containing costs, not only in existing plants, but in construction as well. Finally, local government's responsibility is to provide a climate conducive not only to attracting new investment, but to sustaining commitments already made.

It cannot be emphasized enough, Beaumont is competing with the world. That's something for all of us to think about in terms of labor negotiations, local taxes and services, productivity, and overall business climate.

How well Beaumont competes -- how well we all compete -- will determine where we each go from here. That is the reality of the world today. There is no miracle that will bring back yesterday. There is no miracle that will bring back lost business and lost jobs. To do that will take sound policies, hard work, and time.

Thank you.

Senator BENTSEN. Judge Thomas, I will ask you some questions later, but I want to let all the witnesses make their statements first. Let me add that I'm particularly appreciative of the work you did in helping put this group together.

Judge THOMAS. Thank You.

Senator BENTSEN. Mr. Weinstein, if you could give us your statement at this time, please.

STATEMENT OF BERNARD L. WEINSTEIN, ASSISTANT DIRECTOR, JOHN GRAY INSTITUTE, BEAUMONT, TX

Mr. WEINSTEIN. Thank you, Senator.

I am Bernard Weinstein, assistant director of the John Gray Institute in Beaumont, TX. Affiliated with Lamar University, the institute is a privately funded, nonprofit regional economic development center dedicated to improving the prosperity of the Gulf Coast Crescent, the region that is shown on the chart next to you.

Drawing upon business, labor, industry, and education, the John Gray Institute works with communities from Corpus Christi to New Orleans in pursuit of greater economic diversification and development in response to the powerful forces transforming this important industrial region. I very much appreciate the opportunity to appear before the subcommittee today.

The John Gray Institute has prepared a study for the Joint Economic Committee entitled "Structural Change in the Oil Industry and Its Impact on the Gulf Coast Economy," and I understand that study is being released today. Let me just take a few minutes to summarize the highlights of that study.

During the 1970's, the oil patch, and especially the Texas-Louisiana Gulf Coast Crescent, experienced an unprecedented economic boom. Driven by constantly rising prices for oil and gas, the regional economy showed very rapid employment and income gains. We had increased exploration and drilling activity, the demand for oil field equipment was up. We saw expansions in refineries and chemical plants and the relocation of many energy company offices to the gulf coast area.

For the past 3 years, by contrast, the gulf coast economy has been in a tailspin. Job growth has slowed markedly in all of the region's metropolitan areas, and unemployment rates, for the most part, remain well above the U.S. average despite 2½ years of national economic recovery and expansion. Most significantly, every metropolitan area along the gulf coast has experienced large declines in manufacturing employment since 1980, with losses ranging from 4.8 percent in Lafayette to 33.3 percent in Lake Charles. Virtually all of those manufacturing job losses have been related to the petrochemical sector.

As we've heard, oil refining has been one of the hardest hit industries along the gulf coast. By last count, 106 U.S. refineries have shut down since 1980, and 37 of these are in Texas and Louisiana. Nationally, crude oil refining capacity has dropped from 17.8 million barrels a day to 15.1 since 1980, and 32 percent of that reduction has occurred in Texas and Louisiana.

Probably the most dramatic recent cutback was the layoff of over 1,200 workers, supervisors and managers at Texaco's huge Port

Arthur refinery. That was about 40 percent of the employment base and it was in addition to 2,000 jobs that had been lost through attrition and layoffs over the 3 previous years. Formerly rated at 402,000 barrels a day capacity, the streamlined operation is now rated at only 200,000 barrels.

The Gray Institute has estimated that at least $100 million of purchasing power will be removed from the local economy this year as a result of Texaco's reduction in force, and because of the very strong linkages between refining and other industries and services, additional income and employment will be lost across the State of Texas and elsewhere.

These reductions in force at refineries combined with lower oil prices have resulted in serious economic consequences for our region. The Golden Triangle, encompassing Beaumont, Port Arthur, and Orange, TX, is a good case in point. Like most other gulf coast communities, the dominant industries in our area are all related to the petrochemical sector—oil refining, chemical production, steel, ship repair and rig fabrication, and off shore services. The Gray Institute has been monitoring employment changes among the Golden Triangle's 42 largest industrial employers since 1981. These 42 firms, the 42 largest firms in the Golden Triangle, have reduced their combined work force by 32 percent over the past 3 years. The biggest losses occurred in oil refining and rig fabrication. Appended to my statement is a table which shows the areas and the industries in which those job losses occurred. But in all, 12,635 high-paying jobs have disappeared from the Beaumont-Port Arthur-Orange metropolitan area, and most of these jobs are probably gone permanently.

The contraction of refining in the Golden Triangle and elsewhere has resulted from a number of factors. Anticipation of continually rising prices and demand for gasoline, combined with incentives offered by national energy policies, led to a 20-percent increase in domestic refining capacity between 1975 and 1980. Most of that expansion took place in California, Texas, and Louisiana. Just as this new capacity came on stream, prices and demand for gasoline and other distillates began to drop. Consequently, oil refining has become a marginally profitable business at best. For example, a recent survey by Platts Oilgram found that the best profit margin among Houston-area refiners was a 64-cent-per-barrel loss.

Senator BENTSEN. What was that?

Mr. WEINSTEIN. The best profit margin among Houston-area refiners was a 64 cent per barrel loss.

Senator BENTSEN. It doesn't sound like they make that up on volume, do they?

Mr. WEINSTEIN. I don't think so. And the worst margin per barrel was a loss of $4.61.

Capacity nationwide has been reduced by nearly 2.7 million barrels since 1980, but the 191 active refineries are currently operating at only 75 percent of rated capacity. With most of the small refineries already out of business or up for sale, the oil companies must now look to their larger units for further reductions in capacity to bring supply and demand more closely into balance.

Some of the other factors that have affected our region and point to a continued decline in the refining industry include the following:

Recent mergers and acquisitions among the big oil companies are being accompanied by the disposition of refinery assets, either to satisfy legal requirements or to raise cash to reduce debt burdens.

As we've heard, it's becoming cheaper to buy refined products abroad than to manufacture them domestically. Over the past year, imports have climbed 50 percent and now account for 10 percent of total domestic gasoline consumption. Imports have been encouraged both by the strong dollar and by excess capacity around the world, particularly in Europe and the Caribbean.

Now OPEC and the other oil exporting nations are spending billions on new, state-of-the-art refineries and petrochemical plants that, because of artificially low crude oil and feedstock costs, will be able to undersell U.S. producers. We really haven't felt the brunt of this new capacity in the Middle East yet, at least not directly on the U.S. market, but that will be an increasingly important factor in the years ahead.

Another factor of concern is the fact that because refineries located abroad are usually not subject to the stringent environmental standards imposed on domestic processing, a further wedge is being driven between U.S. and foreign production costs.

I don't believe that the U.S. refining industry is going out of business, but it is changing. It's changing its product mix and its way of doing business. In the future, emphasis will probably be placed on products with a higher value added than gasoline, such as lubricating base oils and petrochemical feedstocks. This product realignment will be accompanied by new investments in process-control technology, automation and energy conservation. As a result, the refineries of tomorrow will be manned with fewer employees than the refineries of today.

Over the past 3 years, employment in refining nationwide has dropped 13 percent, from 173,000 to 150,000. By the end of the century, the industry will probably employ fewer than 100,000 workers. The implication of these trends for gulf coast communities heavily dependent on the petrochemical sector has become crystal clear. We well understand that industrial diversification is imperative for the economic survival of our region.

Thank you very much.

[The tables attached to Mr. Weinstein's statement follow:]

EMPLOYMENT DATA

Gulf Coast MSA's

(Thousands)

	1977		1980		Dec. 1984		% Change 1980-Dec.1984	
	Total Non-Agr.	Mfg.	Total Non-Agr.	Mfg.	Total Non-Agr.	Mfg.	Total Non-Agr.	Mfg.
Texas								
Beaumont-Port Arthur	142.8	40.0	148.7	38.5	141.0	30.5	-5.2	-20.8
Houston	1,173.6	195.1	1,439.3	240.2	1,539.7	197.2	7.0	-17.9
Galveston-Texas City	65.3	11.9	70.3	11.4	72.0	10.1	2.4	-11.4
Victoria	N.A.	N.A.	27.1	3.5	28.4	2.9	4.8	-17.1
Corpus Christi	104.3	13.1	124.7	16.1	131.0	14.7	5.1	-8.7
Louisiana								
Lake Charles	54.0	11.3	66.3	13.5	58.0	9.0	-12.5	-33.3
Lafayette	58.1	3.2	78.8	4.2	90.4	4.0	14.7	-4.8
Baton Rouge	176.6	23.8	203.9	25.9	214.8	22.2	5.3	-14.3
New Orleans	455.5	51.2	499.4	53.5	506.9	40.2	1.5	-24.9

Sources: Supplement to Employment & Earnings, States & Areas, Data for 1977-80, Bureau of Labor Statistics, Sept. 1981; Louisiana Department of Labor; Texas Employment Commission.

Employment Trends in the Golden Triangle

	No. of Firms (12/84)	Dec. 1981	Dec. 1982	Dec. 1983	Dec. 1984	12/81-12/84 Jobs Lost Number	%
I. Geographic Area							
Beaumont	18	13,930	10,896	10,887	10,715	3,215	23.1
Orange	8	8,535	5,049	4,589	4,660	3,875	45.4
Port Arthur	7	11,391	9,353	7,858	6,772	4,619	40.5
Mid-Jefferson Co.	6	3,365	3,087	2,842	2,716	649	19.3
Silsbee	3	2,172	2,078	1,901	1,895	277	12.8
Total	42	39,393	30,463	28,077	26,758	12,635	32.1
II. Industrial Sector							
Oil Refining/Related Activities	8	13,087	11,528	10,371	9,065	4,022	30.7
Petrochemicals	16	10,751	9,998	9,353	9,002	1,749	16.3
Offshore Services	5	3,075	812	555	951	2,124	69.1
Ship Repair/Rig Fabrication	3	5,840	1,594	1,343	1,378	4,462	76.4
Paper/Forest Products	4	2,782	2,730	2,686	2,607	175	6.3
Others	6	3,858	3,801	3,769	3,755	103	2.7
Total	42	39,393	30,463	28,077	26,758	12,635	32.1

Senator BENTSEN. Thank you, Mr. Weinstein.

Our next witness will be Mr. William Tell, who is senior vice president of Texaco, and one of the largest employers in the area.

STATEMENT OF WILLIAM K. TELL, JR., SENIOR VICE PRESIDENT, TEXACO, INC., WHITE PLAINS, NY

Mr. TELL. I'd like to say that we are very appreciative of the opportunity to come before this subcommittee to discuss what we think is a very pressing national problem and to try to share with you the perspective of a major refiner in the United States, certainly a major refiner for many years in the Golden Triangle area, a major employer, a company that as a result of the forces that I'll describe had to take very painful steps in recent years in the Texas gulf coast, steps that were not only painful financially but clearly very painful in human terms, as has been identified and I suspect will be further developed this morning.

The unfortunate thing today and why I think these hearings are so valuable is that there seems to be a public perception that energy is the one sector of the economy where there's not a problem. We have a surplus. We've got declining prices. It was just a bad dream what we went through in the 1970's and although we have a lot of problems to address, energy isn't one; and that's unfortunate because when you go below the surface of that perception of surplus you find some very alarming facts and I'm pleased to have the opportunity to review some of these with you from our perspective. I want to again express my appreciation to you and this subcommittee for holding hearings which hopefully will focus some public attention on trends and changes in the energy sector of our economy that if not addressed and corrected may cause us to have very much the prospect of repeating some very, very difficult and painful experiences that we went through in the past decade.

Texaco is a major international oil company. We have 10 operating refineries in the United States and we refine just about a million barrels a day. That would place us, I guess, presently as the third largest refiner, not too much difference really when you get up there in the top 4 or 5 in terms of capacity and operating volume.

But in addition, we have a major refining interest outside the United States. In fact, our refining capacity outside the United States exceeds the capacity in the United States. So we are coming here as an American company that's concerned that has taken the kind of action that businessmen have to take, given these circumstances. I don't think of us as protectionists. I can think of no company that has a stronger commitment to the principles of free trade and we continue to support free trade. We don't think it's unreasonable, however, to insist that that free trade also be fair and it certainly isn't fair at the present time. It sometimes seems a little anomalous to be talking in general platitudes about free trade when the trading partners in many instances are a cartel, which is almost the antithesis of free trade.

I think everyone has recognized that overriding all considerations of free trade must always be concern over the Nation's na-

tional security. And these are the areas that I would like to develop this morning.

We have taken actions, as I have indicated, Senator Bentsen, that have been difficult financially and in human terms. Since 1981, we have either closed or disposed of five refineries in the United States and we have reduced the capacity at our largest refinery by some 200,000 barrels a day.

Our refining system is, I think, in very good competitive shape, as good as technology and productivity and management can make it, but it's under enormous pressure at the present time. We are not looking for some action to spare us the difficult steps that this entire domestic industry is going to have to take to be competitive. We've got that behind us and we have made billions of dollars of investments in our domestic plants to get them as competitive as we can.

But raw material costs are over 80 percent of the total cost of a refinery and there's no way in technology, in productivity, in management skill, that you're going to be able to offset subsidies of as much as $3 a barrel or more in raw material, fuel, sometimes financing, through investments and technology. It's just as straightforward as that.

So here is an industry that has since 1981, as you indicated, closed over 100 plants. I've seen different estimates as high as 130. There's no question that we have less than 200 operating refineries in the United States at the present time and that we are running those refineries at 12 million barrels a day and our domestic demand is around 16 million. So we are pretty deeply into imports, but we certainly have forces in motion that are going to put this country deeper and deeper into both product and crude imports.

And as businessmen, we are doing what we have to do. But as Americans, we have to feel that there are some policy concerns here. It's not good enough just to drift into this increasing dependence without some kind of conscious policy judgment of whether this is really in the U.S. interest. I guess I would feel more comfortable as a businessman taking the actions that I'm taking if I knew that there had been careful study and analysis as to what exactly is the present configuration of our refining industry and where these trends will be taking us in the next few years and a judgment made by responsible officials that it's OK, that our country can afford from the standpoint of energy policy and national security and economic policy to let this domestic refining base continue to erode.

The configuration of our domestic refining base in the years ahead at this point will not be determined by a conscious policy judgment of the U.S. Government the way things are going. It's going to be determined by the conscious policy judgments of foreign governments. And that doesn't seem appropriate.

Well, let me just review briefly—I think other witnesses and certainly you in your opening statement, Senator Bentsen, and Congressman Brooks, have touched on the salient facts here. We've had this increasing trend in imports. In 1984, imports of gasoline were up 40 percent over 1983 levels. Middle distillates were up 70 percent. We are approaching now in the case of gasoline nationwide about 10 percent of the demand and some have said, "Well,

that really isn't a problem. It doesn't sound like very much." Well, you have to get down into submarkets to really understand what's happening.

In the Northeast at the present time, 20 percent of demand for both gasoline and distillate is provided by foreign imports—20 percent in the Northeast today. Now that's more than enough volume to have a significant impact on the price structure.

Of course, the domestic refiner is trying to hold the market share, holding on as long as he can, and the entry mechanism for the foreign refiner is simply a lower price. As the domestic refiner tries to hold shares to drop his price to meet that foreign competition, the margins are squeezed, but obviously there reaches a point at which the domestic refiner cannot drop the price further and in comes the new entrant. But that new incremental barrel determines very much the price structure for the overall market and as those imports come into the Northeast, an area that's traditionally been supplied to a large extent from our refineries in the gulf coast, they are just displacing the product from the gulf coast refineries and, of course, the impact on that region has been described so well by witnesses this morning.

So there are powerful trends in motion. They have taken their toll and from our perspective we see really little basis to believe that these trends are about to level off or reverse. Indeed, the kinds of forces that are causing them to occur may well be accentuated in the future.

This has happened before the major new export refineries have even come onstream. The first one, in Saudi Arabia, did come onstream late last year. There's another one that will be on this year and over then next 18 months we're going to have over a million barrels a day of new refining export capacity in the Middle East. Japan has said it's not prepared to accept any of that material and you identified two countries in Europe that have already indicated they have concerns. The European community is looking at the matter very carefully. The German refining industry lost almost $1 billion last year and that government is taking a very careful look.

And here we are, the prize market, with the door pretty widely open. And that may provide some short-term consumer benefits. That has to be looked at pretty carefully. But in the intermediate and long term, that's going to be a very heavy price to pay and there's where we think policy judgments are required and required promptly.

Senator BENTSEN. Mr. Tell, I'm going to place your statement in its entirety in the record, although I think it's going to be pretty difficult to improve on what you have just said. You had a very interesting and helpful statement. Would you like to sum up any other point before closing?

Mr. TELL. I think that I have made the major points, Senator. I guess I would like to just simply identify, if I may, in conclusion what I think are the types of policy questions that specifically need to be addressed.

You see, the responsibility for this appears to be spread all across the landscape, both in the executive branch and on the congressional side. So many different committees have jurisdiction and responsibility, and I just hope that divided responsibility doesn't

become no responsibility. I am so pleased that you have taken the initiative in this subcommittee and I would hope that other committees of the Congress will do the same.

We have had indications that the executive branch does have a major policy review underway and I hope that will be promptly concluded and the recommendations brought before the public.

One thing that is missing are accurate data. We don't really know exactly how much operable refining capacity exists in the United States. One company that had an Op-Ed piece this morning in the paper indicated they thought there was 16 million barrels. I have seen estimates from very knowledgeable people that say it may well be below 14 million. That's an enormous spread and that's too big to be guessing.

Senator BENTSEN. I agree. I believe we have that information, but we do not collate it. That problem exists not just on oil or gasoline. We have the same failing across the spectrum on trade. But neither this administration nor the previous administration or any administration, Democrat or Republican, has done the job of putting that information together in a usable form. We have more information than any other trading nation with the possible exception of Japan. The difference is they do a great job of collating their information. We do not.

You talk about the divided authority of the Congress. That's true. But we have passed effective laws that have not been utilized. We have not had leadership on the trade issue where a President—and again I say Democrat or Republican—has said, "This is a number one priority for our country."

This sad state came about because we were such a dominant economic power in this world that in the first GATT meetings after World War I, we traded off economic advantage for some foreign policy objective of the moment. What we have now is a different situation where if you had the U.S. Trade Representative come up with a tough policy on trade in some bilateral exchange with another country, who would come in? The State Department would come in and say, "You can't do that. That's an ally of ours." And the Secretary of Defense would come in and say, "We've just negotiated a base with those people. You can't make them mad." Then somebody else comes in and says, "You're going to start a trade war."

Mr. Tell, we're in a trade war, and we're losing it. That's why it's important that our President utilize the effective administrative authority he has under section 301. There's been one section 301 case filed that I can remember by a President, and he was forced into that, dealing with Canada. And it was effective and it did the job. So, for unfair trade practices, section 301 authority is available, ready to be used. It's a bad situation when we have to start mandating that a President ought to do that.

Mr. TELL. Well, I certainly share those thoughts, Senator Bentsen, and I realize there are other witnesses so I will conclude at this time.

As I indicated in our statement, we have attempted to identify with some specificity what kinds of questions and issues that really do need study and where there is additional data required in the hope that for those who do have policy responsibility, that it might

be useful in helping them make plans to get on with the review that I think we all seem to agree this morning is urgently needed, and I thank you again for the opportunity to participate in these hearings.

[The prepared statement of Mr. Tell follows:]

Prepared Statement of William K. Tell, Jr.

Texaco appreciates the opportunity to appear before this Subcommittee to review a number of serious national policy issues presented by the sharp increase in petroleum product imports into the United States combined with the accelerating decline in U.S. domestic refining capacity. The growing dependence by the U.S. on both crude oil and petroleum product imports raises concern in the areas of economic and trade policy, energy policy and national security. This committee's oversight responsibility with respect to economic and trade policy makes these hearings both timely and appropriate.

SIGNIFICANT TRENDS

Volumetric Growth in Product Imports

In 1984 gasoline imports into the U.S. averaged over 309,000 BPD, an increase of 38% over 1983. Middle distillate imports, such as diesel fuel, heating oil and jet fuel, averaged 255,000 BPD, an increase of 70% over 1983 levels. These amounts are much greater when partially refined product imports such as naphtha, blending stocks and unfinished oils are included. Chart 1, 2 and 3 further detail the increasing trend in U.S. petroleum product imports.

Domestic Refiner Margin Squeeze

Gasoline imports in the 1960's and 1970's supplied 1 to 2% of U.S. demand but by the end of 1984 have risen to almost 10% of total U.S. demand when blending

stocks used in marketing gasoline are included. Analysis of current trends indicates a continued upward movement in product import dependence in 1985 and beyond. Gasoline imports are primarily directed at the U.S. East Coast where they now approach 20% of demand when imported blending stocks are included. Twenty percent of middle distillate demand on the U.S. East Coast also is currently supplied by imports.

The increasing flood of product imports has exerted significant downward pressure on refiner margins in the U.S. In today's highly competitive marketplace, it is the price of the last barrel seeking to enter the market which can determine the overall level of prices.

There is increasing evidence that foreign export refiners seeking access to U.S. markets and the displacement of domestic refined products are offering to sell gasoline, middle distillates and heavy fuel oil at prices sharply below any reasonable estimate of refinery costs. This cost/price relationship is set forth on Charts 4 and 5. Cost absorption of $2-$3 per barrel by government-owned export refiners appears to be occurring, representing as much as 7½¢ per gallon. In an attempt to compete against foreign competition which analysis indicates is engaged in sales below cost, domestic refineries are experiencing depressed margins and large losses in widespread instances. (See Chart 6).

Decreasing U.S. Refining Capacity

Competitive market conditions since decontrol in 1981 have led to an extensive rationalization and contraction of the U.S. refining industry. In 1981, there were 315 operating refineries in the U.S. with a total capacity of 18.6 MMBPD.

By the end of 1984, the U.S. had less than 200 operating refineries with 15.6 MMBPD of operable capacity. Of that 15.6, approximately 1.2 MMBPD is shut down. Therefore, operating capacity is about 14.4 MMBPD. Some reduction in U.S. refining capacity has been required to remove the inefficient facilities constructed during the period of Government controls in the 1970's which artificially stimulated demand and encouraged the construction of small inefficient refineries. Today, however, the U.S. is rapidly approaching the point where future plant closings will involve modern, efficient facilities which simply cannot competitively survive against below-cost, subsidized sales by foreign government export refiners seeking access to U.S. markets. The future configuration of the U.S. domestic refining industry over the next several years may well be largely determined by the policies of foreign governments.

Declining U.S. Crude Prices

Faced with mounting losses, U.S. refiners have reduced the price paid to U.S. producers for domestic crude. The declining trend in U.S. crude prices and the resulting reduction in producer cash flows has led to a sharp reduction in U.S. exploration and drilling activity. Unless these trends are reversed, the U.S. must anticipate higher levels of crude imports in the years ahead which, when combined with the increasing level of product imports, could push the U.S. in a few years to a level of 50% import dependence, a level which the experience of the 1970's demonstrates is an unacceptable dependence on foreign sources.

Construction of New OPEC Export Refining Capacity

In the face of significant excess refining capacity today in major consuming countries, an estimated 1.4 million BPD of new export refining capacity is nevertheless under construction in several OPEC countries and will come on stream in the next two years or has just been completed. Their strategic objective will be to gain access to consumer markets, including the U.S. The locations of these refineries in the Middle East and North Africa as shown on Chart 7 are in areas which were the source of crude supply disruptions in the 1970's.

Other exporters of product to the U.S. in recent years include Romania and China. In addition, Russia, at various times, exports large volumes of petroleum products into Europe creating surplus product which, by displacement, often moves to the U.S. Dependence on these areas as an important source of energy supply for the U.S. and Europe can create additional foreign policy and defense costs.

A list of the leading countries currently exporting petroleum products into the U.S. is shown on Chart 8.

Impact of Environmental Investments

During the last ten years, the domestic refining industry has expended over $30 billion for environmental facilities to meet mandated product specifications and to control plant emissions. Additional Superfund taxes and other hazardous substance regulations which are pending will significantly increase the environmental costs of U.S. refineries. A study by Batelle Columbus Laboratories indicates that U.S. refiners incur mandated environmental costs of as much as $1.50 per barrel over foreign export refineries.

Outlook

OPEC crude oil producers in today's market often experience difficulty in selling their available crude at official government prices. Sales discounted from official prices threaten the overall crude price structure. In these circumstances, government operated refineries and processing arrangements provide a convenient basis to veil the discounting of crude prices. In addition, such refineries may also provide an opportunity to realize additional petroleum revenues from exports over and above the sales volumes permitted under the OPEC established crude oil quotas set for member countries. For these reasons OPEC export refineries can be expected to continue to operate at high levels and be expanded. Such refineries are also an important source of local employment and therefore have additional political significance.

The desirability of the hard currency available to foreign exporters from the sale of petroleum products into U.S. markets further suggests that the trend in increased U.S. product imports will continue and perhaps even accelerate. Crude oil and raw material costs represent the largest single component of a refiner's cost (over 80%). There is no way through reduced operating expenses or increased productivity that U.S. refiners can compete against $2 - $3 a barrel raw material subsidies.

There exists the potential that growing U.S. import dependence, combined with a shrinking U.S. refining base, will permit establishment of a new "seller's" market in the years ahead. Domestic sales below cost to achieve market dominance are, of course, outlawed under U.S. antitrust laws. It would be ironic if the U.S. were to permit foreign government to achieve what U.S.

policy has prohibited on the part of private domestic firms.

The prospect of increased access to U.S. markets by foreign product exporters is further enhanced by comparatively low import duties and the absence of quotas or other restraints. U.S. petroleum product import duties on gasoline are only 1.25¢ per gallon and were set in 1947 when the wholesale price of gasoline was approximately 10¢ per gallon. These duties have never been increased to reflect price increases and other changed economic relationships since the mid-1940's. Such duty levels could be increased 7-10 times solely on the basis of changed economic and market conditions since the time they were first imposed. U.S. import duties on petrochemicals average 8 to 10 times higher than petroleum products at present. European product import duties currently are as much as 4 times higher than the U.S. and Japan refuses to admit foreign refined gasoline and middle distillate to enter the country.

Confronted with mounting losses, increased environmental investments and taxes, the possible loss of the capital investment incentives provided under current tax laws, and continued competition from sales below cost, U.S. refiners will continue to shut down facilities. Current U.S. refining capacity approximately equals U.S. demands. There exists, however, an apparent surplus of domestic refining capacity in excess of 3 million BPD in large part as a result of reliance on product imports. It is not at all clear that maintenance of these idle units has been adequate to permit a rapid increase in crude running in the event of a supply disruption. Moreover, some surplus in refining capacity is required to compensate for the periods when units must be shut down for testing and inspection. Historically, operating at 90% of capacity is about the optimum the industry can hope to achieve. Some excess capacity will be required to run crude oil from the SPR in the event of a

supply disruption. When these factors are taken into consideration the existing cushion of surplus refining capacity in the U.S. is not as large as it might appear.

Foreign refineries during a period of worldwide crude disruption may not have crude supplies above their domestic requirements to provide a basis for refining products for export. Moreover the prices demanded for such products will undoubtedly reflect the escalated levels which experience in the 1970's indicates will occur following a supply disruption. The question of how much excess U.S. refining capacity the U.S. requires is complex and not at all clear. What is clear, however, is that once a plant or major unit has been shut down for any extended period of time, it is most unlikely that the equipment would be in a condition to resume full operations in any short period.

PROMPT NATIONAL POLICY REVIEW REQUIRED

There is a strong indication that, absent a shift in national policy, the U.S. will continue to drift into a growing and excessive dependence on foreign product imports. Overall, imports of crude and product into the U.S. increased by 8% in 1984, the first increase following several years of decline. The painful U.S. experience with excessive dependence on foreign imports in the 1970's dictates that a policy review should be immediately undertaken by responsible officials to determine at what level increased crude and product imports cease to be prudent from the standpoint of economic policy, energy policy and national security. The short-term consumer benefits available from product sales below cost will be more than offset by the longer-term price

increases which will occur from excessive import dependence in the event of a future supply disruption or the reestablishment by OPEC of a seller's market. How much longer can existing levels of domestic refining capacity be maintained under the severe margin squeeze and mounting losses resulting from competitive prices apparently based on sales below cost?

A number of economic issues should be included in the policy review. Key areas of the economy will be adversely affected if increasing levels of petroleum imports lead to the reestablishment of a seller's cartel or are cut-off by a supply disruption. These include GNP growth, employment, inflation, interest rates, balance of payments and federal budget deficits.

The policy review should also include an evaluation of current U.S. trade policy in the energy sector together with an appraisal of the practicality of existing enforcement mechanisms to deal with a natural resource subsidy form of unfair trade practice. U.S. Customs procedures relating to the administration and interpretation of existing duties on finished products and blendstocks should also be reviewed. Wide discrepancies and inequities currently exist and are more fully described in Chart 9. Consideration should also be given to the justification and utility of maintaining a Strategic Petroleum Reserve (SPR) at an annual cost in excess of $4 billion if adequate refining capacity is not available to process crude from the SPR during a period of supply disruption.

Finally, there is the area of national security. Whether an imminent national security concern is created at present levels of crude and product imports is a matter upon which differing views have been expressed. In recent Congressional hearings the Department of Defense (DOD) testified its petroleum

product requirements would increase four-fold to approximately 2 million barrels per day in the event of a major military mobilization. Moreover, many of the refineries operated by U.S. companies outside the U.S. which were suppliers to DOD in prior years have more recently been closed or sold to foreign governments. These developments place a greater dependence on our domestic refining base.

Those expressing complacency at current levels should be queried as to what point in the future, on the basis of existing trends, our dependence on foreign imports would reach a point where a genuine national security concern exists. What is the criteria policymakers should employ in making such a judgment and what industry operational lead times must be accommodated for any remedial action to be timely implemented?

The timing and form of any remedial measures required to protect U.S. interests in this vital area should be determined by the judgments made in the comprehensive policy referred to above in formulating U.S. policy in these key areas. If analysis indicates the current level of domestic refining capacity should not be permitted to further erode, strong action at an early date would be required.

A listing of some of the more critical issues and questions Texaco believes should be addressed is set forth below. Responsibility for the analysis and resolution of these economic, trade, energy policy and national security issues appears to lie in many different departments, agencies, and committees in both the Executive and Legislative branches of the U.S. Government. Leadership and coordination will be required to ensure that such divided responsibility does not result in the failure of any party to accept

responsibility for these difficult and complex matters which vitally affect the national interest. This Subcommittee's oversight role is most important in this regard.

In the past there has been a tendency to deal with politically difficult problems of this nature only in a crisis. Unfortunately, our Country's inability to address and resolve such problems in advance of a crisis cost the U.S. economy in the 1970's billions of dollars in addition to a loss of policy flexibility and significant additional costs in the areas of both foreign policy and defense.

In the absence of any indication of a policy shift by the U.S. Government, it is reasonable to anticipate that privately owned U.S. refiners will continue the established pattern of plant closings required by the severe margin squeeze and mounting downstream losses. During the 1970's the petroleum industry was widely criticized for failing to warn the public that the U.S. was losing its energy self-sufficiency and the risks associated with a growing import dependence. Texaco believes that current trends and developments in the energy sector contain the potential for a future shortage which could compromise our economic and national security to a greater extent than in the 1970's. We compliment this Subcommittee for holding these hearings to focus public attention on these critical issues. There is urgent need for the policy analysis studies currently underway within the Administration to be promptly concluded in order to permit timely informed judgments to be made.

POLICY ISSUES AND QUESTIONS TO BE ADDRESSED

I. Economic Policy

1. What would be the intermediate and longer term impact in the following key areas of the economy if increasing volumes of subsidized petroleum product imports produce a continuing pattern of refinery closings combined with a reduced level of domestic exploration and oilfield services activity:

   a. GNP growth
   b. employment

2. What will be the impact in the following key areas of the U.S. economy if excessive dependence on petroleum imports leads to the reestablishment of an effective seller's cartel with significant upward movement in energy prices:

   a. GNP growth
   b. inflation
   c. interest rates
   d. balance of payments
   e. federal budget deficits

3. What impact on the following key areas of the economy would result from a supply disruption if combined crude and product imports are permitted to reach a level of 50% of U.S. demand:

   a. GNP growth
   b. inflation
   c. interest rates
   d. balance of payments

e. federal budget deficits

II. Trade Policy

1. As a matter of national policy, should we expect our domestic refinery industry to compete against sales of imported products by producer governments which evidence strongly indicates are below cost? Are there any other major U.S. industries which national policy would place in such a position to obtain short-term consumer benefits?

2. Would below cost sales by foreign competitors differ from the practice of predatory prices outlawed by the U.S. antitrust laws?

3. What is the justification for the level of U.S. import tariffs on gasoline and other petroleum product not being revised since 1947 to reflect current economic relationships?

4. What is the justification for the average import duty level on petrochemicals being at least 8 to 10 times higher than petroleum products?

5. What is the justification for European import tariff levels on petroleum products from many sources being as much as four times higher than the U.S.?

6. Why should the U.S. have a completely open door for petroleum product imports when Japan drastically limits the levels of foreign

refined products permitted access to its domestic market?

7. Are existing trade laws and procedures adequate to deal with the new phenomenon of below cost sales of petroleum products to gain access to U.S. market?

III. Energy Policy/National Security

1. What is the minimum level of domestic refining capacity required to protect against future economic shocks from the reestablishment of an effective sellers' cartel and insure our national security in the event of a supply disruption?

2. Does an analysis of present trends in petroleum product imports and refinery closures indicate the U.S. may be approaching such minimum level? What are the industry operational lead times that must be taken into consideration in adopting remedial policy?

3. Should the configuration of the U.S. refinery industry be determined by the self-interest policies of foreign governments?

4. What amount of excess refining capacity in the U.S. is required to obtain optimum benefits from the $15 billion investment in the SPR?

5. As a matter of energy policy, is the U.S. satisfied with current levels of domestic drilling and reserve additions? Is there a relationship between depressed refinery margins and the prices paid to U.S. producers for U.S. crude oil? Is reduced cash flow to

domestic oil and gas producers a major reason for the dramatic decline in U.S. exploration?

6. What are the odds that at some point in the next 10 years there will be another major energy supply disruption? Is a complacency over current product import trends consistent with this assessment?

7. What incremental demand for petroleum products will occur in the event of a major military deployment, i.e., military requirements, tank-topping by consumers fearing shortages, additional domestic industrial activity required to support military operations?

8. How reliable suppliers of petroleum products are Romania, Russia (into Europe and by displacement into the U.S.), Libya and China?

9. How reliable a product supplier would Canada, Mexico, Venezuela and other Western Hemisphere countries be in the event of a major supply disruption which threatened their domestic requirements? Would the price levels of their products be expected to escalate in the event of a supply disruption?

10. What are the additional military costs associated with insuring U.S. access to foreign crude supply, including the cost of keeping the sea lanes open and protecting against tanker attacks? When these military costs are added to the market price of imported products, are such products less costly to U.S. consumer than domestic products?

11. What limits on the flexibility and substance in U.S. foreign policy are created by excessive dependence on foreign energy sources?

IV. Administrative

1. Specifically, what groups in the Executive Branch and the Congress have responsibility from a policy standpoint for analyzing these issues? What actions or studies in these areas are currently under way?

2. As an institutional matter, can we learn from the experience of the 1970's and adopt appropriate remedial measures in advance of a crisis?

grgl(R9)

CHART 1

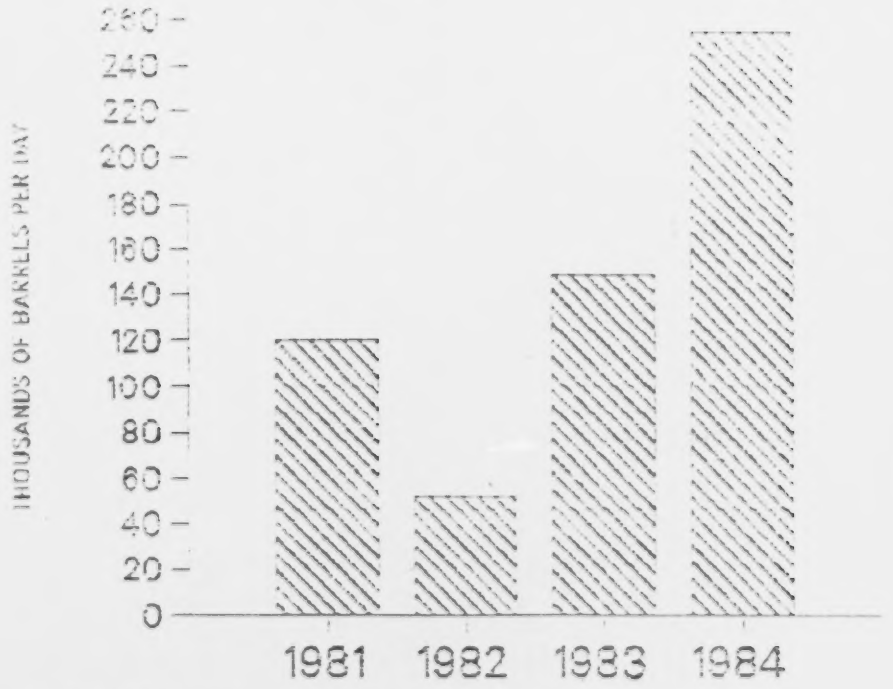
U.S. GASOLINE IMPORTS

(EXCLUDES SHIPMENTS FROM P.R. & V.I.)

SOURCE: Department of Energy/American Petroleum Institute

CHART 2

U.S. IMPORTS OF MIDDLE DISTILLATES*

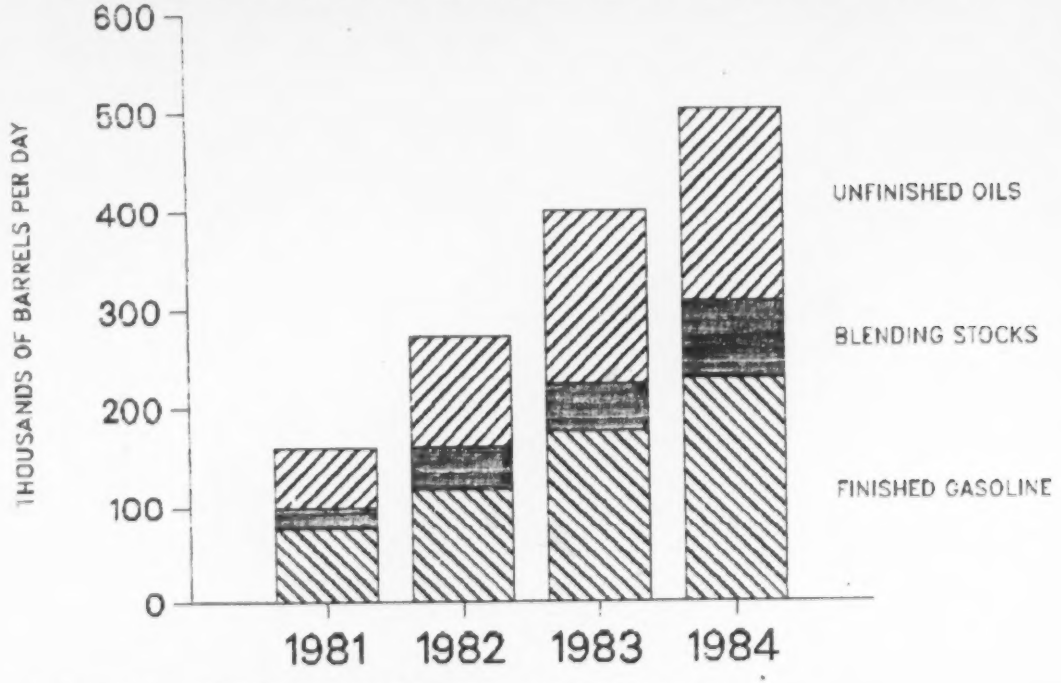


*EXCLUDES SHIPMENTS FROM PUERTO RICO & VIRGIN ISLANDS

SOURCE: Department of Energy

CHART 3

U.S. IMPORTS OF FINISHED GASOLINE, BLENDING STOCKS AND UNFINISHED OILS*



*EXCLUDES SHIPMENTS FROM PUERTO RICO & VIRGIN ISLANDS

SOURCE: Department of Energy

CHART 4

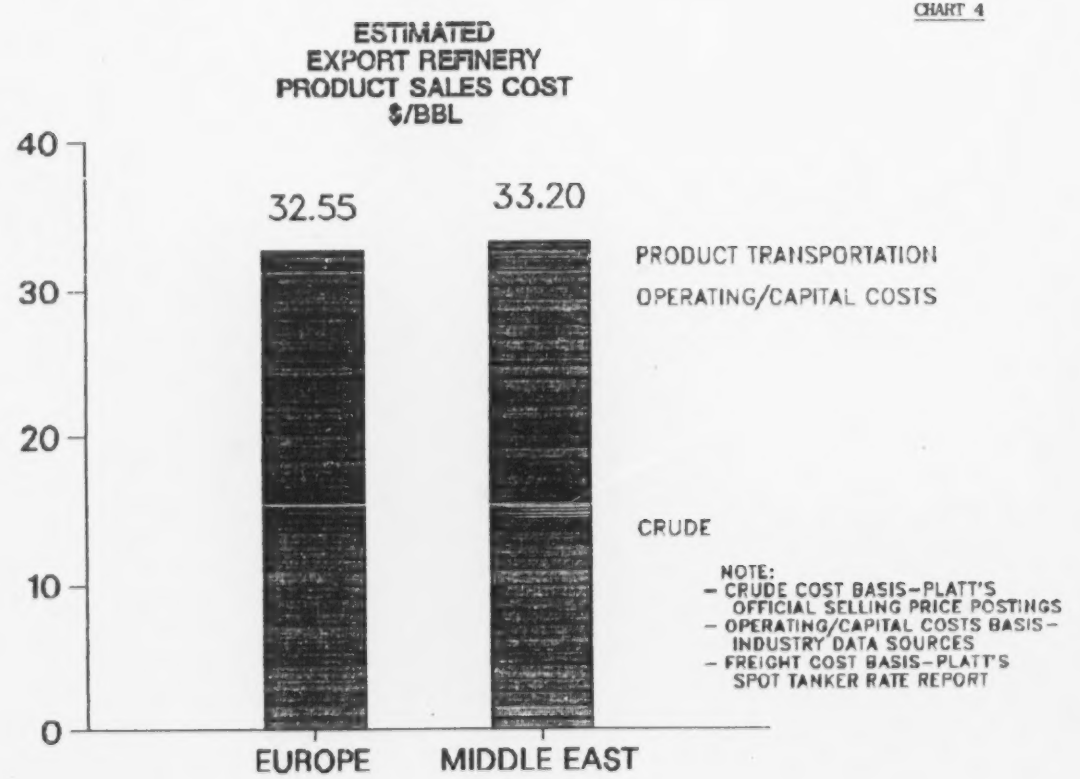
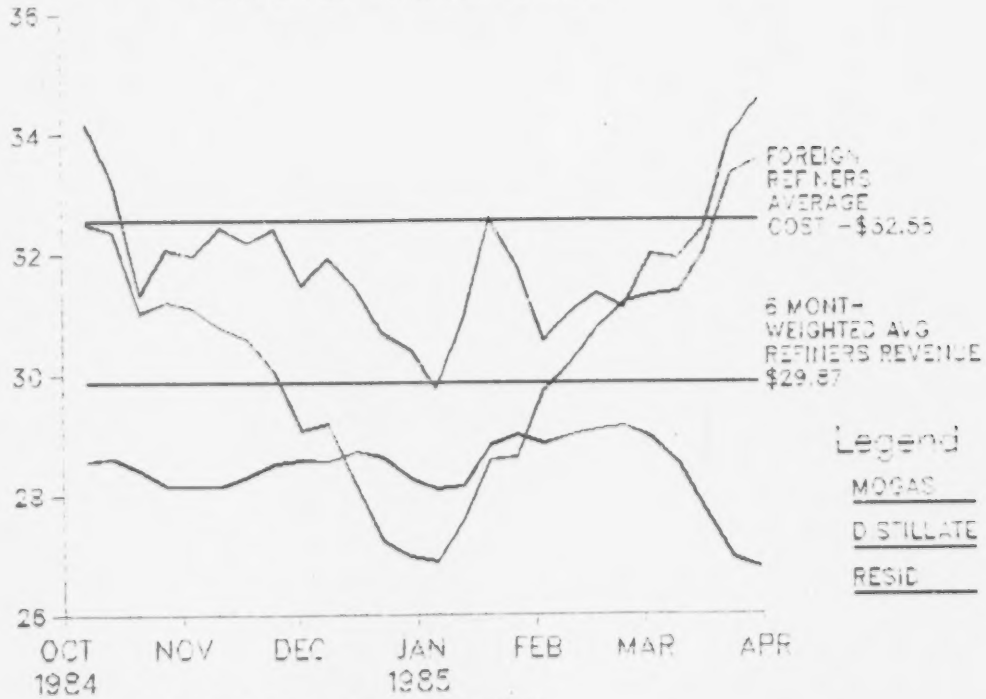

ESTIMATED
EXPORT REFINERY
PRODUCT SALES COST
$/BBL
40
30
20
10
0
32.55
33.20
PRODUCT TRANSPORTATION
OPERATING/CAPITAL COSTS
CRUDE
NOTE:
- CRUDE COST BASIS-PLATT'S OFFICIAL SELLING PRICE POSTINGS
- OPERATING/CAPITAL COSTS BASIS-INDUSTRY DATA SOURCES
- FREIGHT COST BASIS-PLATT'S SPOT TANKER RATE REPORT
EUROPE
MIDDLE EAST

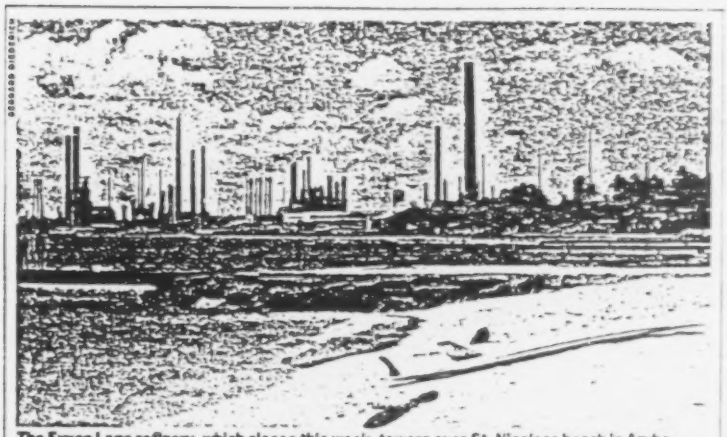
CHART 5

U.S. EAST COAST
PLATT'S HIGH SPOT IMPORT PRODUCT SALES PRICE
VS. FOREIGN REFINER'S COST



SOURCE: Platt's / American Petroleum Institute

TIME - APRIL 8, 1985 CHART 6



The Exxon Lago refinery, which closes this week, towers over St. Nicolaas beach in Aruba

Burning Out

A slump in Western refineries

The chimney stacks along the St. Nicolaas beach on Aruba no longer belch smoke into the luminous tropical air. After 60 years of refining more than 6.5 billion bbl. of crude, including 1 out of every 16 bbl. of aircraft fuel used by Allied forces in World War II, Exxon's Lago refinery, once the largest in the world, will shut down this week. The closing marks the end of an era in the world oil industry and spells trouble for the 70-sq.-mi. Caribbean island. The refinery has provided Aruba with more than half its annual income for better than two generations. Writes the Curaçao-based Antillen *Review*: "The chilling truth, that a total economic collapse might well be the country's fate within two years, has at last dawned upon a wide spectrum of the nation's decision makers."

The bleak oil-refinery situation is not limited to Aruba. The Caribbean's eight major refineries are cutting production, and more than 100 U.S. refineries have ceased operating since 1981. Additional closings are expected. Texaco is shutting down its 65,000-bbl.-a-day plant in Lawrenceville, Ill., and a 20,000-bbl.-a-day operation in Amarillo, Texas. Since September, the company has halved the capacity of its Port Arthur, Texas, refinery to 200,000 bbl. a day.

The effects of the closings h ve been felt most acutely in the Texas Golden Triangle near Beaumont at the heart of the Gulf Coast refining and petrochemical industry. Since 1981 the area has suffered a 30% decrease in its oil-refinery work force—a loss of 4,000 jobs. Employment in the region's petrochemical industry is down 16%, or 1,749 workers. Offshore-services employment is off 69%—2,124 jobs. Says Debbie Brown, executive director of Orange Christian Services, a Gulf Coast community-support organization: "About two years ago, we saw 40 to 50 families a month in need of emergency assistance. Today we have jumped to 40 or 50 a day."

Even as American refineries have been closing, imports of petroleum products into the U.S. have been steadily increasing. The Energy Information Administration, a federal clearinghouse for energy data, reports that imports, including fuel oil, finished gasoline and gasoline-blending components, have risen about 24% during the past four years. The amount of gasoline entering the U.S. market from abroad nearly doubled during that period, to 291,000 bbl. a day in 1984, while imports of oil requiring further processing increased more than 50%, to an average 230,000 bbl. daily.

Part of the reason for the glut of oil-refining capacity was the industry's over-optimistic assessment of world demand for energy products. Total U.S. consumption of petroleum products rose only 4% last year after a five-year decline. In addition, Western refineries face increasing competition from oil-producing countries, which now refine their own crude at home. Between 1984 and 1988, Saudi Arabia, Mexico, Kuwait, Libya and other oil countries will add about 3 million bbl. a day to their refining capacity.

American refineries are launching a battle against the energy imports. Veteran Washington Lobbyist Charles E. Walker represents a group of 15 companies called the Independent Refiners Coalition, which has called for either a quota or a combination of a quota and tariff on gasoline imports. The Reagan Administration appears unlikely to support such measures, but Walker has begun aggressively lobbying Congress. Says he: "America is rapidly replacing its dependency upon imported crude oil for dependency upon foreign gasoline. When our domestic refineries are closed, foreign refiners will be free to dictate gasoline prices to the American consumer." *—By Jamie Murphy. Reported by Bernard Diederich/Aruba and John E. Yang/Washington*

THE HOUSTON CHRONICLE
SECTION 2
FEBRUARY 13, 1985

Temple warns of increasing dependence on oil imports

By TOM SCOTT
Houston Chronicle

Texas Railroad Commission Chairman Arthur "Buddy" Temple III warns the United States is becoming dependent on petroleum product imports from foreign suppliers at the expense of Gulf Coast refiners.

Petroleum product imports are forecast to take an even greater share of the U.S. market, further deepening vulnerability to foreign suppliers and eroding the domestic refining industry, Temple said Tuesday.

This is a particularly disturbing trend along the Gulf Coast, which claims one-fourth of the nation's refining capacity, he said.

"A number of Gulf Coast refineries have seen reduced capacity, severe financial losses and even closings," Temple said. "The list of these troubled refineries is growing — Hill Petroleum Co., Charter Co., United Refining Co. and Houston Oil Co."

Recently, Temple said, Valero Energy arranged to aid its Saber refinery "with an infusion of capital from of all sources — the Arabs."

"We are now at a point where a domestic independent refinery is getting the Arabs to pump money into that refinery on the condition that they can find a low-cost supply of crude oil as a feedstock."

Last year, Temple said product imports jumped 15 percent over 1983 levels to some 2 million barrels a day. By 1990, if the trend continues, he said product imports would rise by another 24 percent to nearly 2.5 million barrels a day.

Temple

In 1984, gasoline imports rose more than 30 percent over the previous year, and imports of distillate fuel oil (including diesel and home heating oil) increased more than 62 percent.

Temple said the problem will be compounded by additional refineries coming on stream in other parts of the world.

In the next three years alone, six new export refineries in the Middle East and in North Africa will be operating, adding some 1.1 million barrels per day of petroleum product to world markets. These refineries include three in Saudi Arabia (Yanbu, Rabigh and Jubail), one in Kuwait at Mina Abdulla, one in the United Arab Emirates (Ajman), and one in Libya at Ras Lanuf.

In outlining his priorities as chairman of the state commission, Temple said it is important to see that drilling permits are issued in a timely fashion, that rules to protect fresh water are observed and that abandoned wells are plugged.

"We have a very important role in protection of fresh water, and it is a role we take very seriously," Temple added.

As chairman of the railroad commission, Temple oversees the vast oil, gas, coal, trucking and freight industries in the Lone Star State. The Railroad Commission, originally created for the regulation of railroads in the state, has over the years had its jurisdiction and responsibilities greatly expanded.

Temple, who was unsuccessful in his bid to win the Democratic nomination for governor in 1982, more recently was stymied in a bid for chairmanship of the National Democratic Party.

A major contributor to the party, Temple says that he was not a candidate for the chairmanship and may return to private life to manage his own personal business when his railroad commission post expires in 1988.

Temple, 42, is the son of a prominent East Texas family that has amassed great wealth through three generations in the forest products business. The family's original company, Temple Industries, was purchased by Time-Life Inc., and his father, Arthur Temple Jr., is co-chairman of that corporation.

In an interview, Temple said his personal business involves Exeter Investment Co., essentially a "family company involved in various business enterprises, including real estate development, bank holdings and ready-mixed concrete." Temple also is on the board of Capital National Bank in Austin.

Temple spoke Tuesday at a program sponsored by Commerce Title Co. at the Houston City Club.

AN OIL SHOCK THAT HURTS ONLY U.S. REFINERS

LOW-PRICED IMPORTED PRODUCTS PLEASE CONSUMERS BUT WORRY THE INDUSTRY

In Houston, a motorist pays just 88¢ a gal. for his gasoline. In New York, a delighted homeowner orders heating oil for $1.17 a gal., a dime less than he paid at this time last year. In Newark, N.J., a jet takes off carrying fuel that, at 79¢ a gal., cost 10% less than the airline paid in 1984. All across the country, the prices of oil products have taken another sizable dip—and the reason goes beyond the glut that has forced the general downward drift in oil prices over the past two years. In large part, this new round of lower prices is the result of a sudden—and, to many, worrisome—flood of cheap oil-product imports into the U.S.

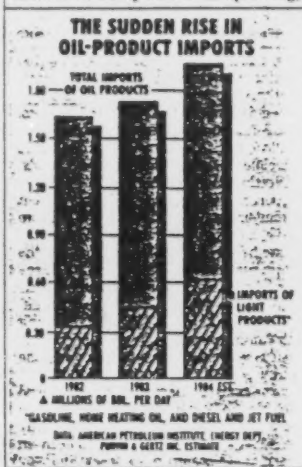
A rash of new refineries in the oil-producing countries—many built almost exclusively for exports—is the main source of these oil products, and their surprising success in penetrating the U.S. market has the local refining industry up in arms. With Middle East producers set to open a string of additional facilities over the next three years, domestic refiners are descending on Washington to demand protection. "Unless they get some help," says John P. Venners, a refinery consultant, "most of these refiners just won't make it."

VENEZUELAN MUSHROOMS. Crude-oil imports increased just 3.6% in 1984, and they are not expected to rise appreciably in the years immediately ahead. But total oil imports rose nearly 8% as imports of products jumped 15%. While the overall figure should level off again as the economy cools down, the shift from crude imports to foreign-made products is likely to continue.

Last year's increase came mainly in gasoline, home heating oil, and other so-called light products, which leaped 35%. Gasoline imports, in particular, have been soaring. Currently pouring into the country at a rate of 310,000 bbl. a day, foreign gasoline now holds 5% of the U.S. market—double its share four years ago. And even this figure may understate things by as much as one-half. The reason: A substantial amount of "blending stocks"—which are easily upgraded into gasoline—is classified as petrochemicals, qualifying for minimal import tariffs.

These days, major suppliers of gasoline to the U.S. include Venezuela—whose shipments have mushroomed from almost nothing in 1981 to 55,000 bbl. a day—Mexico, and Brazil, which buys crude from Nigeria and reexports it as products. Their cheap products helped push average gasoline prices down by 2.5¢ per gal. in the U.S. last year, to $1.19—the lowest since 1980.

The exporters' gains have come mainly at the expense of refiners along the Gulf Coast, who traditionally have met a large share of Eastern demand. They have been forced either to absorb towering losses or close their gates. Texaco Inc. blames imports for the shutdown last fall of nearly half of its sprawling, 400,000-bbl.-a-day refinery in Port Arthur, Tex. (page 67). American Petrofina Inc. recently warned that it might have to idle its nearby 100,000-bbl.-a-day refinery "temporarily" because of foreign oil products. Sighs Fina CEO Paul D. Meek: "Something has to give."


THE SUDDEN RISE IN OIL-PRODUCT IMPORTS
TOTAL IMPORTS OF OIL PRODUCTS
IMPORTS OF LIGHT PRODUCTS*
1982
1983
1984 EST.
▲ MILLIONS OF BBL. PER DAY
*GASOLINE, HOME HEATING OIL, AND DIESEL AND JET FUEL
DATA: AMERICAN PETROLEUM INSTITUTE, ENERGY DEPT., PURVIN & GERTZ INC. ESTIMATE

So far, Texaco has been the largest refiner to sound an alarm. It has circulated a "discussion paper" noting that foreign gasoline now holds 10% of the Northeastern market and suggesting that Washington study whether it should impose quotas or raise import tariffs. Its efforts, says Senior Vice-President William K. Tell Jr., already are "getting some consciousness raised." Several other majors, including Unocal and Standard of Indiana, are expected to join Texaco soon. At the same time, a group of 15 independent refiners led by Ashland Oil Inc., which calls the rise in oil-product imports "an ominous trend," is orchestrating its own lobbying effort. "By the time this is over," predicts Thomas J. Manning, senior principal of Texas oil consultant Purvin & Gertz Inc., "every oil company in the country will jump in."

Well, maybe not every one. Mobil Corp., which last year opened a 250,000-bbl.-per-day refinery in Saudi Arabia with the Saudi government as its partner, warns that new moves to restrict imports "would delay rationalization of the industry, waste capital and labor, and cost the consumer money for the sole benefit of special interests."

Nonetheless, independent refiners are planning a nationwide media blitz built around the theme of national security. They will warn that cheap OPEC products would wreck the U.S. refining industry—now poking along at only 75% of capacity—and leave the nation dangerously dependent on imports for its fuel. They and the other disgruntled oil companies are proposing several specific measures to limit imports. Among them:

- **Boost tariffs.** The existing 1¼¢-per-gal. tariff on gasoline imports was imposed in the 1950s, when crude cost less than $3 a bbl. Now some refiners want Congress to raise it by 10¢ or so to restore its former relationship to crude.
- **Halt "dumping."** Proponents charge that OPEC refineries should be curbed because they get crude at well below world market prices. The International Trade Commission is looking into the matter.
- **Impose quotas.** President Reagan could order that product imports be restricted to levels of prior years, when their market shares were much smaller.

Only a year ago, many U.S. refiners shrugged off the import threat. Most of the new products from the Mideast, they reasoned, would flow into Europe and the Far East. But European refiners are even more laden with overcapacity than their American counterparts, and their markets are weaker. With the dollar so strong, much of the oil product that had been destined for Europe was diverted to the U.S. The situation in Europe has been exacerbated by the British coal

miners' strike, which has forced local refiners to produce extra fuel oil to replace the lost coal. Since only so much of any one product can be made from a barrel of crude, this has only worsened the surplus of gasoline.

PLAY HAVOC. And the worst is probably still to come. By 1987, nearly 1.2 million bbl. more daily refining capacity will be up and running in Saudi Arabia, Kuwait, and Libya, adding to the 2 million bbl. a day of oil products that OPEC already can export. In Saudi Arabia alone, the Royal Dutch/Shell Group and its government-owned partner will open a 250,000-bbl.-a-day export refinery this summer, while an even larger Greek-backed joint venture is still being planned.

All this could play havoc with companies far beyond the refining network along the Gulf Coast. Already, small independent refiners with lucrative niches far inland are facing unaccustomed competition as the Gulf Coast surplus spills over. For 50 years, Entex Inc.'s Allied Materials Corp. operated a 9,000-bbl.-a-day refinery in Stroud, Okla. Then, last November, the refinery shut down. "If this keeps up," says Allied President Jerry W. Plant, "there won't be an inland refinery left in the country." Even shippers are feeling the sting. Richard C. Maybruck, director of chartering for New York's Cove Shipping Inc., blames cheap oil imports for the sale of five of the 11 tankers it had used to transport fuel from the Gulf to the Northeast.

Yet chances of quick relief seem slim. After passing a major trade bill last year, Congress is in no mood to tackle such problems again. And the Reagan Administration knows that new import barriers would only divert OPEC exports to—and draw fire from—Europe, where energy ministers are meeting in March to air their own worries over Persian Gulf exports. With gasoline prices falling and the energy crisis a faint memory, it may be impossible for refiners to convince anyone outside the oil industry—particularly consumers—that the nation is in danger. "Until we get gas lines again," moans an official at one major oil company, "it's going to be tough to make a case." Before then, of course, time may have run out for many refiners.

By Mark Ivey in Houston, with Barbara Starr in Washington and William Glasgall in New York

PORT ARTHUR: HOW A BOOM TOWN IS TURNING INTO A BACKWATER

Few towns have felt the pains of the refining industry's problems as sharply as Port Arthur, Tex., the Gulf Coast port 90 mi. east of Houston that is home for both Texaco Inc.'s and Gulf Oil Corp.'s largest plants. Since 1982, Port Arthur's 63,000 residents have been battered by layoffs and shutdowns at smaller refineries. Then last fall the aging seaport—already nervous about the fate of Gulf's refinery because of the company's 1984 takeover by Chevron Corp.—learned that Texaco would close half of its 400,000 bbl.-per-day plant and lay off 1,200 of its 3,000 workers.

By Christmas week, when word leaked out that American Petrofina Inc. might shut its 500-worker plant, the town was reeling. "People here used to think a refinery job meant lifelong security," reflects Floyd Forse, head of the Oil, Chemical & Atomic Workers International Union local at the Texaco plant. "Now no one knows what to think."

'EVERYTHING FROZE.' For a mostly one-industry town like Port Arthur, such uncertainty can be the kiss of death. When problems hit the refineries, thousands of local craftsmen and service companies suffer as well. The day Texaco announced its layoffs, says Cal T. Raines, manager of the local Dryden's clothing store, "business stopped completely. Everything froze."

Signs of the slowdown can be seen all over town. The number of houses for sale has doubled in the last year, to 900, and personal bankruptcies have soared. Officially, unemployment is 16%, but the real level is much higher,

UNION CHIEF FORSE: A REFINERY JOB NO LONGER MEANS LIFETIME SECURITY

because the now idle Texaco workers "voluntarily" quit in return for bonuses. "I had 20 men coming off the highway yesterday looking for work," says a contractor. "It was like something out of *The Grapes of Wrath*."

Port Arthur has certainly seen better days. In the early 1900s, following the famous Spindletop oil discovery in nearby Beaumont, the town overflowed with fortune seekers. To process oil from the discoveries, the predecessors of Texaco and Gulf built refineries that, by the 1950s, employed 5,000 each. Thousands more worked at dozens of other refineries and chemical plants. Luxury hotels teemed with oilmen looking for a good time. Many of them found it across the narrow Sabine Neches channel on "Pleasure Island," where by day they thrilled to the rides at the midway and by night they danced to the bands at the chandelier-bedecked ballroom.

The good times started coming to an end in the 1960s, when thousands of white families fled Port Arthur to escape school integration. The town enjoyed a reprise in the 1970s and early 1980s, when oil prices—and refinery profits—soared. Recalls one worker: "Anyone who could carry a wrench was making $13 an hour."

But since 1982, Port Arthur has lost almost a third of its 11,400 heavy industrial jobs, according to the nearby Lamar University's John Gray Institute. Jobs have dried up not only in refining but also in the town's two other main industries, shipbuilding and offshore drilling.

The city is trying to cope. It is installing a dry dock—one of the largest on the Gulf Coast—that will employ 1,200. It is also trying to entice the Navy to choose it over 17 other Gulf towns for a new base. And it has mounted a recruiting blitz to bring in other industries.

But except for the base, which would create 5,000 jobs starting in 1988, none of these remedies seems strong enough. Like the refining industry it so depends on, Port Arthur seems destined to struggle for years to come.

By Mark Ivey in Port Arthur

The New York Times November 12, 1984

Business Day

The New York Times

U.S. Oil Refiners in Squeeze

Shrinking Earnings at the Leading Refiners

	Refining Capacity (000 barrels a day)	1983 Refining Earnings (millions)	Estimated 1984 Refining Earnings (millions)
Chevron *	2,109.4	$ 98	$-120
Texaco **	1,206.0	-30	-134
Exxon	1,200.0	456	174
Standard Oil (Ind.)	1,011.0	216	65
Shell Oil	1,005.2	238	255
Mobil	750.0	151	33
Atlantic Richfield	728.0	474	290
Standard Oil (Ohio)	654.5	453	210
Marathon Oil	588.0	77	90
Unocal	490.0	123	60
Ashland	462.9	176	74

* Includes Gulf Oil. ** Includes Getty Oil. Texaco supplies no domestic refining figures.
Sources: American Petroleum Institute (capacity data), Drexel Burnham Lambert (Marathon earnings), Donaldson, Lufkin & Jenrette (Ashland earnings), Dean Witter (other earnings)

Bleak Year For Profits

By STUART DIAMOND

American oil refiners are having a terrible year, squeezed by flagging demand, excess capacity, new overseas refineries and a rise in imports of gasoline and herting oil.

Analysts expect this year's profits of the 11 largest domestic refiners to plummet 57 percent, to $1 billion, from 1983's $2.4 billion. The two largest refiners, the Chevron Corporation and Texaco Inc., are projected to lose a combined $254 million this year. This is in dramatic contrast to the banner years of 1981 and 1982.

The plight of domestic refiners will be a major topic when the American Petroleum Institute convenes in New Orleans today. Dozens of refineries have closed, and many that remain open are paying more for crude oil than they receive for the products they make from it. Moreover, prospects for rapid improvement appear bleak.

"The refining industry is in bad shape, and substantial improvement is still some years away," said George F. Friesen, who tracks refining activities for Dean Witter Reynolds Inc.

Frederick P. Leuffer, an oil analyst at Cyrus J. Lawrence Inc., adds: "Red ink is being bled all over the place. The returns on refining margins are totally unacceptable."

People in the oil industry agree. "The refining business is bad," said Allen E. Murray, president of the Mobil Corporation, in a recent interview. "There is a surplus capacity, and people are moving crude through refineries just to move crude." Although many refineries have closed, he predicted that "there will be a further shakedown in the industry."

Such problems were highlighted in the past two weeks as more than a dozen major refiners reduced their "postings," the prices they will pay for petroleum.

The posted price for West Texas Intermediate crude, the major American grade, was generally cut by $1 a barrel, to $29. The cut will at least temporarily help refiners, but analysts said there is so much competition because of overcapacity that much of the savings will eventually be eroded by retail price cutting.

Some American refiners have large overseas operations, which have also been squeezed, because of overcapacity in Europe and new refineries in the Middle East, Africa and parts of Asia. On Oct. 31 the Exxon Corporation said it would close its Aruba refinery, which operated for more than 50 years, because of weak demand. The plant once processed 440,000 barrels a day but was down to 180,000 this year.

In addition, the dollar's strength over the past year has meant higher oil acquisition costs for overseas American refiners doing business in

Continued on Page D2

Continued - The New York Times November 12, 1984

U.S. Oil Refiners, in Squeeze, Endure Bleak Year

Continued From First Business Page

local currencies.

Mr. Friesen said that Saudi Arabian Light crude, the benchmark grade of the Organization of Petroleum Exporting Countries, costs $29 a barrel in American money but the equivalent of $40 in French currency. Texaco will lose $200 million overseas this year, he predicted. Exxon has done progressively worse each quarter overseas, gaining $116 million in the first quarter but facing a $60 million fourth-quarter loss, Mr. Friesen added.

A look at refining margins underscores the problem. According to an analysis by the First Boston Corporation, an American refiner buying Saudi Light last month at the official $29 price and selling the products in the spot market lost $2.94 a barrel. A refiner buying Bonny Light, the premium grade of crude oil sold by Nigeria, lost $2.96 a barrel in the United States and $3.64 in Europe.

The recent official price cuts for premium oil by Norway, Britain, Nigeria and Canada have improved the margins but only slightly.

The loss on Bonny Light now stands at 58 cents a barrel in the United States and 67 cents in Europe. But since Saudi Arabia has not reduced its official price, the losses on that type of oil are still more than $2.60 a barrel, according to First Boston.

The refiners' present problems began with the sharply rising demand for oil products — particularly gasoline — in the United States in the mid-1970's. Oil company spent billions of dollars to add refineries and to introduce sophisticated equipment for refining heavier (lower grade) oil more efficiently. American refinery capacity rose from 14.4 million barrels a day in 1974 to 18.6 million in 1981.

But oil prices doubled, following the 1979 Iranian revolution, and demand plummeted. It dropped from 18.6 million barrels a day in 1979 to 15.2 million last year. Huge amounts of refinery capacity became idle.

The number of operating refineries has dropped by more than 100 in the past three years — to 214 from 315. And 77 were closed permanently.

At first, refineries producing less than 30,000 barrels a day closed, partly because of the January 1981 removal of Federal oil price controls and of regulations favoring small refiners. But big plants have since closed, including the 104,000-barrel-a-day plant owned by the Amoco Oil Company at Sugar Creek, Mo.

"Although there have been a lot of refinery closings, there is still a lot of surplus around," said Terence B. Redmond, vice president of planning and economics for Amoco's corporate parent, the Standard Oil Company (Indiana).

The typical refinery this year ran at only 75 percent of capacity, compared with 90 percent a decade ago. That means companies are paying for equipment that is not earning money.

To get back up to 90 percent, an additional 2.5 million barrels a day of refinery capacity, or 25 to 30 facilities, would have to cease operations, said Philip L. Dodge of Donaldson, Lufkin & Jenrette Inc. "That's not something that can be counted on in a year or two," he said.

Refiners can expect little help from rising demand. Although American oil use rose 2.5 percent this year after four years of decline, the gain was due principally to strong economic growth and a cold winter and seems unlikely to recur soon, said John H. Lichtblau, president of the Petroleum Industry Research Foundation. He and others predict that oil demand will rise only 1 percent a year for the rest of the decade.

Use of Gasoline Declining

Moreover, he added, continued improvement in automobile fuel economy means that gasoline use will probably drop from this year's 6.7 million barrels a day to 6.3 million in 1990, even with a 10 percent increase in the number of cars.

Imports of petroleum products have also added to American refiners' woes. Because of overcapacity at European refineries, those plants are competing fiercely for American markets. A long coal strike in Britain has led refiners there to produce more residual fuel for electric generation. As a result, their output of home heating oil as a byproduct has mounted, and it is being exported to the United States.

Gasoline imports in 1972 totaled 1 percent of domestic consumption. They totaled 2 percent in 1980, then 3 percent in 1982 and 4.3 percent so far this year. In 1982, 3.8 percent of the American heating oil was imported. Last year it was 6.5 percent, and so far this year it has been 7.5 percent.

Producers Become Refiners

OPEC nations have built major refineries in recent years to seek more profits from their vast reserves of crude oil, and these plants are also squeezing American refiners, at least indirectly, analysts say.

"Even under the most optimistic scenarios many closures, acquisitions and bankruptcies are to be expected in the refining sector worldwide," according to a recent study by The Economist Intelligence Unit.

American refiners have fought back, mainly by laying off employees, increasing operating efficiencies and streamlining their operations in general. Billions of dollars are also being spent to enable the refiners to process a wide range of crude oils.

"The United States refining industry is becoming smaller, tougher, more efficient and more flexible," said Amoco's Mr. Redmond. "In the end, we will balance capacity to a new, lower demand." But in the meantime, he added, "it's tough to earn a profit."

INDEPENDENT OIL REFINERS ARE STILL IN SHOCK

"There is just no more room for the independent refiner." Andrew E. Hill, chairman of Hill Petroleum Co., feels he has plenty of first-hand experience to make that assessment. In February his small Houston refining company filed for reorganization under Chapter 11 of the bankruptcy laws. In its last, desperate year, Hill Petroleum laid off a third of its 350-member work force, slashed salaries, and finished installing a $175 million "cracking" unit to squeeze more valuable fuels out of each barrel of crude oil. Yet, even with a long-awaited uptick in gasoline demand last fall, the losses mounted. "It was like being a cancer patient waiting to die," says Hill, who remains president of the American Independent Refiners Assn.

In recent years, weak demand for gasoline and other oil products has combined with fierce price competition to create a gush of red ink for nearly all refiners, including the major integrated oil companies. But the independents, which have no wellhead profits to carry refining losses, have been slaughtered. In 1980 they owned 183 U.S. refining facilities and produced nearly one-quarter of the country's oil products. More than 100 of these plants have shut down. Those remaining supply less than 18% of the market. And worse may come.

The independents' troubles began with the end of federal price controls on oil in 1981. The cost of crude oil then rose just when pump prices for gasoline sagged. As a result, margins shrank. At the same time, the government phased out its entitlements program, which since 1974 had required crude-rich refiners with cheap domestic reserves to pay crude-poor ones cash subsidies. Deprived of entitlements, scores of small, old, "teakettle" refineries bit the dust.

> 'If [the majors] continue to try to increase market share, it will be a bloodbath'

Now the economics of glut are catching up with the bigger independents as well. Los Angeles' Tosco Corp. lost $378 million last year on sales of $2.5 billion. Struggling to sell two of its three refineries, Tosco is at the mercy of its banks, which have allowed it to stretch out payments on $754 million in debt. Charter Oil Co., of Jacksonville, Fla., has slashed output and is laying off half the workers at its Houston refinery in a last-ditch effort to keep the facility open. Coral Petroleum Inc.'s United Refining Co. and Hudson Oil Co. have filed under Chapter 11.

The struggle is most intense on the West Coast, a traditional stronghold of the independents. There, Shell Oil, Atlantic Richfield, Standard of California, and other majors have been battling for market share, driving gasoline prices down and "putting the squeeze on all of us," says Richard W. Matson, president of Paramont Petroleum Corp., a California refiner. Gasoline prices have inched up of late, easing the pressure. But unless prices move higher still, industry specialists believe a dozen or more California refiners could fall. "If [the majors] continue to try to increase market share," says Matthew J. Talbot, Tosco president and CEO, "it will be a bloodbath."

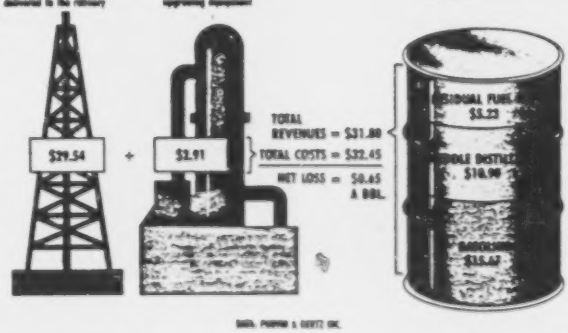
"The majors," moans James D. Francis, president of Charter's refinery unit, "can afford to sit there and wait until the market rationalizes. Independents can't." One reason is their lack of financial muscle. Lenders, burned by billions of dollars in bad energy loans made during the 1970s, have gotten tough. Last year, a $5 fall in the price of crude oil cost such companies as Tosco and Hill tens of millions of dollars in inventory value and working capital. In response, explains one analyst, "the banks froze their credit lines, drying up [independents'] liquidity. Many of these guys never recovered."

SWAP OR SHIP? This crunch has come as funding needs have mushroomed. For one thing, crude procurement has changed radically. Until 1980, most small refiners could buy on credit. Working through one or more exchanges, they used that leverage to buy, then swap, barrels in one region for barrels near their plants to save on transportation. Now, with the majors routinely requiring letters of credit, a refiner making five trades at $30 a bbl. must have $150 in the bank for every barrel involved. Thus more refiners are shipping instead of swapping. "The independents," says Houston consultant William H. Bosler, "have gone from an advantageous position in procuring crude to a handicapped position."

Long-term capital needs also loom large. During the 1970s, small, less efficient refiners could profit even though they churned out large proportions of so-called residual fuel—a low-grade product used mainly to generate electricity. After the 1978 oil price surge, however, electric utilities switched to other energy sources, halving demand for "resid." Compounding the problem, world oil production is shifting to heavier

WHY INDEPENDENT REFINERS ARE OVER A BARREL

Yields and returns per bbl. for a typical independent refinery on the Texas Gulf Coast, first-quarter 1984



CHAPTER 11 FAILS TO FAZE JOHN STANLEY

No one knows more about the perils of independent refining than John R. Stanley—except, perhaps, his 1,078 creditors. The determined founder, owner, and president of GHR Energy Cos. filed for Chapter 11 reorganization in January, 1983. Now he is locked in a nasty battle with his banks over how to restructure GHR and pay its $1.1 billion debt. The banks want to name a new management; Stanley, still running the company, has other plans. "When I'm finished," he predicts, "we'll be known as the Chrysler of the energy business."

His career as a refiner began in 1971, when GHR bought the tiny Good Hope refinery near New Orleans. Stanley had built a Northeast chain of more than 200 Gasland Inc. service stations and expanded into chemicals and natural gas production, and his plans for Good Hope were characteristically ambitious: to create a showcase of refining technology, able to "crack" large amounts of the poorest-quality crudes into high-value products. He was able to keep most of this empire intact during a first Chapter 11 filing in 1975, when a big investment in an ammonia plant was swamped by disappointing prices. But then, after sinking more than $900 million into the Good Hope refinery, the spread between crude-oil costs and product prices shrank dramatically. Unable to make his debt payments, Stanley again sought shelter under Chapter 11.

GHR's 14 banks, led by Chase Manhattan, Continental Illinois, and France's Banque Paribas, now are battling to install a management team that would gradually liquidate the company. In a plan submitted to a federal bankruptcy court in Worcester, Mass., the banks agreed to use income from GHR's South Texas natural gas fields (which they, as secured creditors, control) to pay Stanley's unsecured creditors $200 million over 15 years. In return, the unsecured creditors would back Stanley's ouster. "The creditors are simply not willing to put their money on the line with him anymore," Sumner Darmon, counsel to one of the creditor groups, stated in court.

INDEFATIGABLE. The banks hope to win approval by fall. Although their reorganization plan criticizes recent expenditures by Stanley to build gas reserves and production, Stanley is still in action. When Good Hope shut down last year, he started cutting gas prices to woo new pipeline customers, and production is now up to a daily 361 million cu. ft., from 71 million cu. ft. a year ago. Claiming that GHR's gas fields are currently worth more than $1 billion and can yield up to $250 million a year in revenues, the indefatigable Stanley is looking for $400 million in new bank financing. And he is filing his own reorganization plan to keep himself at the helm and GHR intact.

For the bankers, GHR's charm began to dwindle in 1982, when, after expanding Good Hope's daily capacity from 10,000 bbl. all the way to 300,000 bbl., the refinery lost $180 million. The banks then forced GHR to transfer its natural gas holdings to a bank-controlled trust. "I was in desperate shape and couldn't make payroll," says Stanley. "But they told me that to get any money, I had to sign. It was a reign of terror." The refinery could not stand alone, so Chapter 11 followed.

Still unsettled is the fate of the idle plant. Some consultants charge it was built piecemeal, operated at a reckless pace, and undermaintained. Stanley denies this. Observers, noting the surplus of refining capacity in the U.S., also doubt that a sale would recoup much of the plant's costs. But recently, over the bankers' opposition, Stanley won court approval to start building a $25 million "coker" unit to make the plant more marketable.

Stanley claims that a sale could come soon, but the bankers are wary. Says one bank consultant: "We think he wants to fix it up and run it again." They fear most a replay of his prior odyssey into bankruptcy court. That time he held off creditors for five years—all the while pouring hundreds of millions of dollars into Good Hope.

crudes, which yield more residual oil.

The majors have retooled their refineries—to the tune of as much as $1 billion per plant—to draw more gasoline and other high-quality products from poor crudes. But such sums are beyond most independents, further undermining their ability to compete. In 1984's depressed first quarter, 13 modernized refineries, with 30% of Gulf Coast capacity, netted an average $2.17 per bbl., according to a study by Pace Co. Consultants & Engineers. But experts say less sophisticated plants were lucky to break even (chart, page 52). With more profitable refineries, the majors can afford to distribute products to new markets—often shattering the independents' regional niches. Product distribution "has turned into a big boys' game," says Pace's John A. Matson. "The ones who can't afford to become efficient will probably die."

Some independents have tried to upgrade—often with disastrous results. Powerine Oil Co., a 50-year-old West Coast refiner, spent $160 million on a "coker" and a "hydrocracker" to increase the amount of gasoline it gets from high-sulfur local crudes. The hardware failed to deliver, and Powerine—caught in the West Coast price war with less gasoline to sell than expected, mounting losses, and impossible debt payments—succumbed to Chapter 11 in March. An attempt to upgrade has also undone GHR Energy Cos., which ran out of money before completing work on its Good Hope (La.) refinery (box).

Even going out of business has grown costlier. Fire sales, merger-related divestments, and general consolidation in the industry have put so many old refineries on the block that values have plummeted. "After trying for months to find a buyer, I finally called the scrap dealers," says one down-and-out owner. "But they wanted to charge me $1 million to haul it off."

STARTUP WOES. Many others may soon be in the same bind. This month the Environmental Protection Agency is expected to propose that lead in gasoline be slashed by 90%, to 0.1 grams per gal. Compliance, the EPA says, will cost about $500 million—most of that incurred by smaller refiners. Generally unequipped to make all unleaded gasolines, independent operators would have to install hardware or blend in expensive additives. "Either way," says Dewey Mark, executive vice-president with Diamond Shamrock Corp.'s refining company, "it will knock most of them out."

Well-heeled independents are no exception. In 1980, Valero Energy Corp. bought 50% of the small Saber Energy Inc. refinery in Corpus Christi, Tex., planning a state-of-the-art facility that could reprocess residual fuel into gasoline. Today, $572 million later, Saber is going through serious startup woes. The price spread between resid and gasoline has shrunk from $12 to $5 per bbl.—barely enough to cover operating costs—and its debt repayments start coming due in September. William E. Greehey, Valero's chairman, denies that the project is in trouble and insists that his company has the financial clout to weather a "temporary" market blip. But, warns one consultant, "a year from now the banks will be knocking on Valero's door. Then we will see how deep [the company's] pockets are." ■

CHART 7

MAJOR EXPORT REFINERY PROJECTS

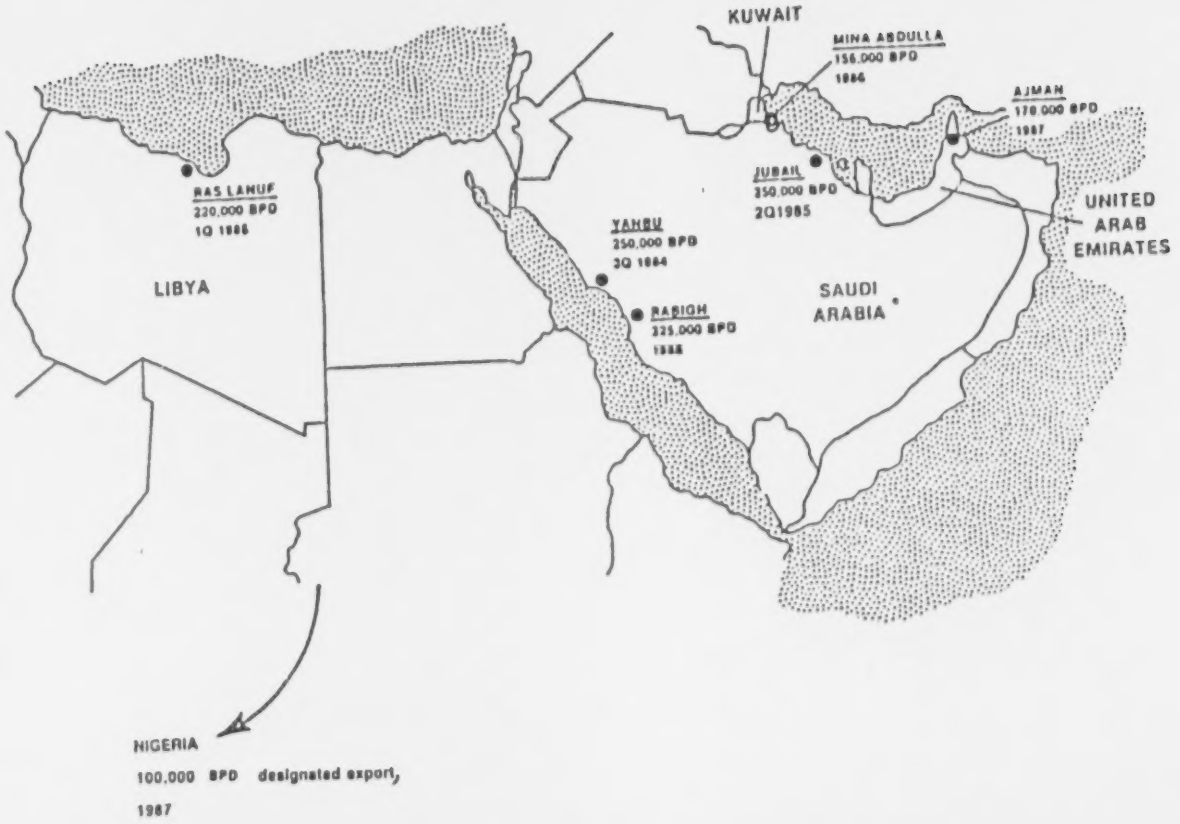
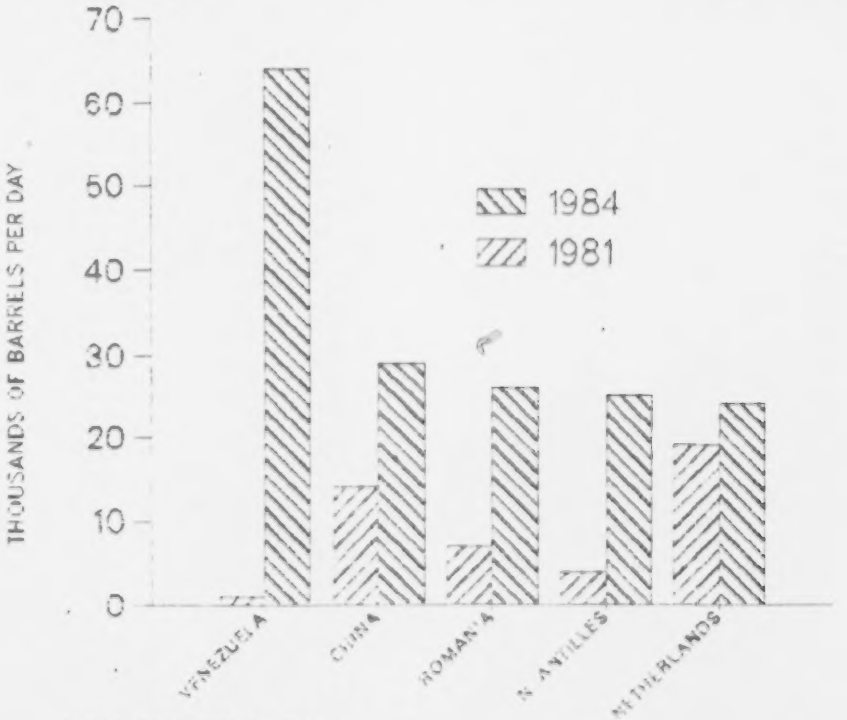


CHART 8

TOP FIVE GASOLINE EXPORTING COUNTRIES



SOURCE: Department of Energy

Chart 9

EXAMPLES OF TARIFF MISCLASSIFICATION OF PETROLEUM PRODUCTS

The U.S. Government should take steps to ensure a more uniform application of product import duties and close loopholes which presently allow certain petroleum products to enter at rates well below those which the Congress intended. These products include naphthas, motor fuel blending stocks and gasoline "spiked" with up to 40% ethanol.

Naphtha

There have been cases where high octane gasoline blending stocks, e.g., catalytic or reformed naphtha have been imported under the unfinished oils or naphtha categories and dutied at 0.25c/gallon rather than at the gasoline tariff of 1.25c/gallon. This loophole has enabled refiners and gasoline blenders to import catalytic naphtha at the lower rate, blend it directly into gasoline, and thereby gain a competitive advantage over domestic refiners and others who import blending stocks at the higher gasoline tariff.

Since the present tariff schedule does not include a separate listing for these motor fuel blending stocks, there has been considerable uncertainty as to the classification of blendstocks for tariff purposes, and the duty has varied at the different ports of entry. This has been further complicated by Treasury Decision 83-173, which adopted updated ASTM Specifications for motor fuel and resulted in naphthas with a combined octane rating below 85 for unleaded and below 87 for leaded no longer being defined as motor fuels. Thus some customs officials assessed cargos of these blendstocks at the motor fuel tariff (1.25c/gallon) while others dutied them at the lower naphtha rate (.25c/gallon) and still others at a higher ad valorem rate.

Gasoline Ethanol Blends

It is believed that ethanol may be entering the United States hidden in gasoline blends from Brazil as it has recently increased its gasoline exports to the United States. However, Brazil is a net crude importer, so it is effectively importing crude and exporting products. Considering the current refining economics, it is not apparent how this operation can be profitable. We believe these gasoline exports may contain 25-40% ethanol. Importers can evade the ethanol import tariff of 60c/gallon plus 3% ad valorem by classifying the blend as naphtha or gasoline. When sold, the product can qualify for a gasohol excise tax waiver of 6c/gal.

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Chart 9

Unfinished Oils

Unfinished oils are partially refined petroleum products that do not meet merchantable product specifications and will not be directly blended into merchantable products. Furthermore, unfinished oils should require further major processing to convert them to merchantable products. Effectively, this definition encompasses all feedstocks such as: Ethylene plant feedstocks, reformer feedstocks, FCCU feedstock, topped crude, etc. These type products that require major processing in a U.S. refinery are charged the crude oil tariff.

Because of lack of definition in the TSUS, some importers have been importing finished gasoline blending stocks that do not meet ASTM gasoline specifications as unfinished oil and paying the lower $0.105/bbl crude tariff. We believe that all gasoline blending stocks that are merely blended directly to motor gasoline without further major processing should be imported under the higher $0.525/bbl finished product tariff.

Senator BENTSEN. Thank you. That's a good statement.

Our next witness will be Mr. Emmett Sheppard, who is president of the Sabine Area AFL-CIO Council. Mr. Sheppard, we're pleased to have you.

STATEMENT OF EMMETT SHEPPARD, PRESIDENT, SABINE AREA AFL-CIO COUNCIL, GROVES, TX

Mr. SHEPPARD. Thank you, Senator. Thank you for the opportunity to speak here this morning.

I agree with you. I believe with good leadership in government like yourself and labor and management working together we can solve many of these problems we have today in the United States. A lot of the testimony that I have has already been brought up this morning, but I would like to highlight on some of them.

In the Sabine area, Gulf in 1957 employed 5,841 people. Today, Gulf employs 2,829. In the last 2 years, we've lost 1,000 employees at Gulf Oil through attrition. We've been lucky there.

At Texaco, across the street, there have been massive layoffs now for the last several years, culminating last September with an announcement that another 1,400 jobs would be eliminated.

The cutback began in November 1982 when Texaco announced that 900 fewer jobs would be available at its Port Arthur refinery. In February 1983, the refinery shut down the package and shipping facilities, affecting another 500 jobs. Last September, 1,400 more jobs were eliminated. There were 120 union-represented jobs saved through negotiations with the company. Floyd Forse, chairman of the Workers Committee at Texaco, announced that these jobs were being lost because of foreign imports.

Texaco has a capacity of 420,000 barrels over there and they're now cut down to 200,000 barrels per day. These layoffs have caused hardships not only on the employees, but on businesses in our area.

Our community is in a depression at this time right now. I would say that the 19-percent unemployment in the Port Arthur area might be a little low right now. Our neighboring community, Orange, is facing the same problem. Our older people are taking early retirements. Our middle-aged people either cannot find jobs or fear the next announcement of a layoff. Our young people are leaving the area to find employment elsewhere.

Chemists say gold will not tarnish. But the Golden Triangle glistens no more.

The entire community feels helpless. Until recently we had no idea what was causing the decreased demand for our products. We were told that consumption was not keeping up with production. Or that our plants were not as efficient as new refineries in other parts of the country. Or that we should be more productive.

The unions in the Sabine area negotiated concessions to increase productivity and save the companies money. Attached I have memorandums of understanding [1] negotiations at Gulf to save our packaging division which was lost at Texaco and increase employment in that department at Gulf Oil.

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[1] The memorandums of understanding referred to by Mr. Sheppard may be found in the subcommittee files.

We did not understand why we were losing these jobs. We knew that the plants in the Sabine area were competitive with any in the country. It just didn't add up. Our plants were constantly being modified and rebuilt. Consumption had been rising. Then, a few months ago, we discovered the real problem—refined product imports.

The United States is becoming as dependent upon imported gasoline today as it was on imported crude oil before the 1973 embargo. Gasoline imports have tripled in less than 4 years. In that same period, we have lost 12,600 jobs in the Sabine area. Five thousand eight hundred of these jobs were directly related to the petroleum and petrochemical industry. Our refineries are operating at less than 75 percent of capacity.

Four thousand two hundred and seventy-five construction jobs in our area are lost. Forty-five percent of our employees in the construction business which is dependent upon oil are now unemployed.

The John Gray Institute reports, "It is appropriate to draw some comparisons between what is happening in this area with what has happened in the basic steel, rubber, and automobile industries.

"Those industries are experiencing or have experienced the same economic pressures of increased foreign competition fueled by government support, cheaper raw products and cheaper labor costs.

"In the last 10 years, U.S. basic steel industry employment has gone from 609,500 to 336,400 employees.

"U.S. auto industry employment industry has dropped from 907,700 to 867,200 employees.

"U.S. oil industry employment industry has gone from 165,200 to 148,000 while 136 U.S. refineries have been closed in the last 5 years.

"Refined petroleum products being imported into the United States now account for about 6 percent of U.S. demand." Evidently that's a bad figure because I heard them testify that it's about 10 percent now.

"If this figure increases significantly, it will aggravate the refining capacity problem further."

That's bad news for the Sabine area and other communities which depend on refinery production as a source of jobs.

Texas Railroad Commission chairman, Buddy Temple, painted an even bleaker picture for domestic refining recently in a speech in Houston. He said, "If the trend continues, by 1990 about 15 percent of the gasoline and distillate fuel oil we need would be imported. Moreover, by 1990 over 70 percent of the residual fuel oil that we burn largely for industrial purposes would come from abroad.

"In the next 3 years alone, six new export refineries in the Middle East and in North Africa will come on line. These refineries, often subsidized by their governments, will add 1.1 million barrels per day of petroleum product to world markets."

Mr. Temple estimates that these imports will more than double in the next 5 years. If this is allowed to happen, the community in which I live will be devastated.

We know what happened to communities which were dependent upon steelmaking for their economic vitality.

We saw those communities taken to their knees by foreign imports of steels. Congress and the administration were told it was coming, yet nothing was done.

We believe that we are in the same posture today. Our community of over 400,000 people lives or dies on the petrochemical refining and processing industry. The jobs that our refineries and plants provide are the economic life blood of southeast Texas.

If imports of refined gasoline and other fuel oil products are allowed to continue to expand, we are certain that our economic conditions are only going to get worse. It is simply a matter of economic reality.

In the Sabine area, we are concerned about the long-range effect of a declining demand for the products that we produce. It takes time and a great deal of capital to build a refinery. It also takes highly skilled manpower.

If imports are permitted to continue to rise, there's going to be less incentive for oil companies to expand their refineries or refit existing units. As the refineries get older, they become less efficient, less competitive in the marketplace.

Oil companies will not invest the capital if there is no demand for the product. They cannot. If imported gasoline is selling for less than they can make it in this country, new refining units will not be built.

Because refineries are so capital intensive, oil companies simply cannot be expected to build or rebuild refineries when they have doubts about a market for the product.

There will be no construction of refinery expansions. We will lose more jobs in building and trades, and that's the reason I'm here today. The market for refined oil products should be protected.

It is in our own economic and national defense interest to protect our nation's domestic refining industry. If we expect American oil companies to remain competitive with nationalized and subsidized oil refiners, we must have a national policy which encourages capital formation in the refining industry.

Texaco, Gulf, Mobil, and the other oil companies can invest their capital in refining or they can invest it in merchandizing. If they can import gasoline cheaper than they can refine it, they are going to invest in merchandizing. It's that simple.

When that happens, our domestic refineries will become less and less efficient and less and less competitive. The cycle encourages more imports and the Nation becomes more dependent upon imported foreign gasoline.

As I said before, the gasoline market should be protected. It clearly would be in our economic and national defense interest to do so.

Thank you for the opportunity to speak today.

Senator BENTSEN. Mr. Sheppard, I found your testimony very interesting. Listening to a man from labor talking about capital formation is encouraging. I know there's a lot of competition between management and labor, but I know of no labor movement that has been more responsible through these tough years than the American labor movement. I look at some of the problems between management and labor in Europe, replete with devastating strikes and strife. And I think there's an understanding more and more in this

country how important it is for labor and management to work together to try to resolve some of these problems.

I am very pleased to see that Congressman Fiedler is here. We're delighted to have you, a very important Member of the Congress and very concerned with this issue. Would you like to make any comment?

Representative FIEDLER. No, thank you, Senator. I would just ask that when those of you give your other testimony I would be interested in hearing any reaction you may have to the former Treasury Secretary Regan's tax plan and its potential impact on your industry.

Senator BENTSEN. Thank you.

And now we have Mr. Bruce A. Melaas from the Celanese Chemical Co., who may have a somewhat different point of view, which certainly deserves to be represented in these hearings. We are pleased to have you, Mr. Melaas.

STATEMENT OF BRUCE A. MELAAS, DIRECTOR, SAFETY, HEALTH AND ENVIRONMENT, CELANESE CHEMICAL CO., INC., DALLAS, TX, ON BEHALF OF THE PETROCHEMICAL ENERGY GROUP

Mr. MELAAS. Thank you, Senator. It certainly is a pleasure for me to be here.

Although I am a representative from Celanese Chemical Co. in Dallas, I want to emphasize today that I am speaking for the Petrochemical Energy Group, a group of independent petrochemical companies; and by independent, I do mean those that are not associated with oil companies.

It is a pleasure for the petrochemical industry independents to be here to discuss with you our concerns as you and your colleagues debate this important question.

The U.S. petrochemical industry is a key contributor to the Nation's trade. U.S. petrochemical industry sales in 1983 were nearly $80 billion. The industry employed 364,000 people and invested $4 billion in new plant and equipment in the United States. The industry made a $7 billion positive contribution to the national balance of trade in 1983. Nevertheless, this represents a 31 percent decline from the U.S. petrochemical industry's positive balance of trade of $10.1 billion in 1981.

From 1981 to 1983, petrochemical employment nationwide also fell by about 8 percent. As world petrochemical markets become more competitive, the U.S. share of those markets is becoming increasingly difficult to maintain. In particular, major petrochemical facilities in Saudi Arabia and Kuwait are presently coming onstream.

To compete, we must maintain access to competitively priced raw materials which we call feedstocks which include naphthas and gas oil. We are concerned not only about the petroleum feedstocks we import but also about the impact of an import quota or fee on the prices of domestically produced fuels and feedstocks.

Past efforts to limit crude and product imports have been unsuccessful in preventing the growth of U.S. consumption of foreign oil and products produced abroad.

Equally important, earlier import limitations have adversely affected the ability of the U.S. petrochemical industry to maintain its international competitive position.

Let me offer an example of the impact that an increase of world market levels of petroleum product prices could have on just one of our petrochemical energy group members.

Goodyear Tire & Rubber Co. operates a large facility in the Beaumont, TX, area which manufactures synthetic rubber. This facility has been in operation since 1958 and its output is shipped to some 25 Goodyear plants throughout the country which manufacture rubber products, including tires, belts, and hoses. Thus, a large number of jobs not only in Beaumont but elsewhere in Texas and throughout the United States are dependent on the production of synthetic rubber at that one Beaumont plant at competitive costs.

The raw materials going into the manufacture of snythetic rubber are directly affected by the price of naphtha and indirectly affected by the price of motor gasoline. If the prices of these petroleum products are forced up, the price of synthetic rubber will be forced up and ultimately synthetic rubber and tires will be imported from abroad.

As a matter of fact, since 1980, imports of synthetic rubber have increased 60 percent.

Raising the price of crude oil in this country above that of world markets necessarily results in an increase in the cost of feedstocks and fuels to the domestic petrochemical industry, particularly the independent sector of that industry. Feedstocks come predominantly from the tailgate of refineries and gas processing plants, although some feedstocks are imported. The rise in the cost of feedstocks in fuels will further erode our ability to compete in several significant ways.

First, foreign competitors manufacturing abroad who do not face the same increasing costs can erode our export trade.

Second, foreign competitors manufacturing abroad will have an added competitive advantage to use against us in our domestic markets resulting in increased imports of petrochemical products. Both of these will affect employment and balance of payment problems.

Third, the purchasers of domestic petrochemical products and consumer goods will find that their costs increase and this impact will be felt throughout the United States in higher prices for such diverse products as medicines, pharmaceuticals, textiles, paints and coatings, plastics, automobiles, fertilizers and pesticides, and a host of other products.

This, in turn, forces on these manufacturers of consumer goods the same problems that will face the petrochemical companies: less exports, more imports, overall less markets—with the resulting impacts on trade.

In a study completed in 1984, the consulting firm of Arthur D. Little concluded that 1983 shipments of U.S. petrochemical-dependent industries amounted to a value of $567 billion. The combined production value of the petrochemical and petrochemical-dependent industries in 1983 was some 31 percent of total U.S. manufacturing production. And that's the big pot we're dealing with.

It's important to look at the history of prior efforts to limit imports of petroleum.

First, it took an elaborate bureaucracy to decide who got access to the cheap foreign oil and in what proportion. The system became one of subsidies heavily influenced by political considerations and a system of indirect price controls on domestic oil since the levels of imports could be adjusted to offset or influence the allowables then set for production of oil in this country.

In addition, empirical data indicate that an ominous long-term change in U.S. petrochemical producers' international market share followed from increasing by quotas and fees U.S. petrochemical feedstock costs above those of foreign producers. New investment in the petrochemical industry shifted to areas having access to cheaper petrochemical feedstocks and in due course world market share shifted as well.

In the late 1950's, the U.S. share of world chemical exports was 23 percent. In 1958, the Mandatory Oil Import Program was instituted and oil imports into the United States were restricted until 1973. With high feedstock costs in the United States and depressed crude oil and naphtha prices in world markets, it became cheaper to produce petrochemicals in Europe and Japan.

From 1958 through 1970, European and Japanese chemicals were 50 to 100 percent higher than the U.S. level on the basis of investment per dollar of sale. This high level of investment lasted until 1971. In 1972, European sales of chemicals exceeded U.S. sales for the first time. In this same year, the U.S. share of world chemical exports fell to 14 percent.

To summarize our historical experience with crude oil and petroleum product quotas and fees:

First. They generated an extensive complex and inequitable government involvement in the producing, refining and petrochemical industries.

Second. They failed to prevent a growing U.S. dependence on foreign crude oil and refined products.

Third. They forced capital investment in petrochemical facilities to be made outside the United States and subsequently the world market share of these foreign producers increased but the U.S. market share declined.

Those in the independent petrochemicals industry can sympathize with our colleagues in the refining industry faced with pressure from foreign producers. Indeed, the decline in our industry's favorable trade balance from 1981 to 1983 has been caused in large part by increased petrochemical imports which rose 20 percent. Some of this pressure is the result of broad economic forces such as the strength of the dollar and of the U.S. economy compared to other economies. But the imposition of a crude oil or petroleum product import limitation will weaken the competitive position of the manufacturing industries downstream of crude oil and petroleum product production and very possibly force these other industries to come before you with their claims for protection.

The independent petrochemical industry joined many other industries in welcoming the termination of oil price and allocation controls, including the oil import program. It would be a drastic step backward into time and to reregulation of the energy and pe-

trochemical industries to resurrect an oil import program now. Thank you.

[The prepared statement of Mr. Melaas, together with an attachment, follows:]

PREPARED STATEMENT OF BRUCE A. MELAAS

My name is Bruce A. Melaas. I am Director, Safety, Health and Environment for Celanese Chemical Company, Inc. Today I appear on behalf of PEG, the Petrochemical Energy Group. PEG is a group of independent petrochemical companies--those which are not vertically integrated with major refiners. I have served as Chairman of PEG and have testified in numerous forums on the subjects of petroleum and petrochemical imports and their impact on the U.S. economy.

We are concerned that limitations on crude oil or petroleum product imports adopted to protect domestic refiners will severely burden the competitive viability of the U.S. petrochemical industry and of the many domestic industries, from pharmaceuticals to automobiles, which are dependent on petrochemical products. Past efforts to limit crude and product imports have been unsuccessful in preventing the growth of U.S. consumption of crude oil and products produced abroad. Equally important, earlier import limitations have adversely affected the ability of the U.S. petrochemical industry to maintain its international competitive position.

The Petrochemical Industry

The U.S. petrochemical industry is vital to the economic welfare of the United States, and is a key

contributor to the nation's trade balance. U.S. petrochemical industry sales in 1983 were nearly $80 billion. 1/ The industry employed 364,000 people, 2/ and invested $4 billion in new plant and equipment in the U.S. 3/ The industry made a $7 billion positive contribution to the national balance of trade in 1983. 4/ Nevertheless, this represents a 23 percent decline from the U.S. petrochemical industry's positive balance of trade of $10.3 billion in 1980. 5/

As world petrochemical markets become more competitive, the U.S. share of those markets is becoming increasingly difficult to maintain. In particular, major petrochemical facilities in Saudi Arabia and Kuwait are presently coming on stream. 6/ To avoid further decline in

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1/ 1983 Petrochemical Industry Profile, prepared for the Petrochemical Energy Group, by Arthur D. Little, Inc., September 1, 1984 (hereinafter "Petrochemical Industry Profile").

2/ Id.

3/ Id.

4/ Trade Trends in Petrochemicals: 1983, A Report to the Petrochemical Energy Group, Arthur D. Little, Inc., August, 1984 (hereinafter "Trade Trends in Petrochemicals: 1983").

5/ Id.

6/ The Probable Impact on the U.S. Petrochemical Industry of the Expanding Petrochemical Industries in the Conventional-Energy-Rich Nations, Final Report on Investigation No. 332-137 Under Section 332(b) of the Tariff Act of 1930, USITC Publication 1370, United

[Footnote continued]

the petrochemical industry's positive contribution to the U.S. trade balance, to employment and to domestic investment, competitively priced raw materials (which we call feedstocks) including naphthas and gas oils, must remain available to the industry. We are concerned not only about the petroleum feedstocks we import but also about the impact on the prices of domestically produced fuels and feedstocks of an import quota or fee.

The Impact of Import Fees or Quotas

It is difficult, if not impossible, to address the question of the possible imposition of quotas and fees on imported petroleum products without first addressing the question of quotas and fees on crude oil imports.

Imposition of a fee on imported crude oil can be expected to raise the cost of crude oil, not only for imported oil, but also for domestic crude oil. Evidence of this, if any is needed, can be found in the studies done by the Congressional Budget Office this year. CBO said that a $5.00 oil import fee would raise about $9 billion a year, 25% of which would come from the windfall profit tax, "since an import fee would allow the price of all domestically

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[Footnote continued]
States International Trade Commission, April 1983, pp. 63 and 86-7.

produced oil to increase, thereby increasing the windfall profit and tax on each barrel." 7/

Raising the price of crude oil in this country above that of the world market necessarily results in an increase in the cost of feedstocks and fuels to the domestic petrochemical industry, particularly the independent sector of that industry. Petrochemical feedstocks come predominantly from the tailgate of refineries and gas processing plants, although some petrochemical feedstocks are imported. The rise in the cost of feedstocks and fuels will further erode our ability to compete in several significant ways:

First, foreign competitors, manufacturing abroad, who do not face the same increase in costs, can erode our export trade.

Second, foreign competitors, manufacturing abroad, will have an added competitive advantage to use against us in our domestic markets, resulting in increased imports of petrochemical products. Both of these will affect employment and balance of payment problems.

Third, the purchasers of domestic petrochemical products will find that their costs increase, whether the product comes from the U.S. or abroad, and this impact will

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7/ Congressional Budget Office, Report to the Senate and House Committees on the Budget, Reducing the Deficit: Spending and Revenue Options at 239 (February 1985).

be felt throughout the United States in higher prices for such diverse products as medicines, pharmaceuticals, textiles, paints and coatings, plastics, automobiles, fertilizers and pesticides, and a host of other consumer products. This, in turn, forces on these manufacturers of consumer goods the same problems that will face the petrochemical companies: less exports, more imports, less markets--with the resulting impacts on employment and balance of payments. In a study completed in 1984, the consulting firm of Arthur D. Little, Inc. concluded that 1983 shipments of U.S. petrochemical-dependent industries amounted to a value of $567 billion. The combined production value of the petrochemical and petrochemical-dependent industries in 1983 was some 31 percent of total U.S. manufacturing production. 8/

Fourth, the prices of consumer goods, whether fuels or products, will rise.

Historical Perspective

These almost certain results will have to be weighed against the possible benefits of a fee on crude oil. In weighing the merits of imposition of petroleum import quotas or fees, it is important to look at the history of prior efforts.

8/ Petrochemical Industry Profile, p. 32.

Much of what I will say is documented by "The Oil Import Question: A Report on the Relationship of Oil Imports to the National Security" by the Cabinet Task Force on Oil Import Control (February 1970). 9/ That report deals with the period where "cheap" foreign crude oil was the driving force. Perhaps one quote will suffice to make a point: "Without import controls the domestic wellhead price would fall from $3.30 per barrel to about $2.00, which would correspond to the world price. Although we cannot exclude the possibility, we do not predict a substantial price rise in world oil markets over the coming decade." 10/

It would be difficult to describe briefly the elaborate bureaucracy it took to decide who got access to the cheap foreign oil and in what proportion, but a short-hand description would be that the system became one of subsidies, heavily influenced by political considerations, and a system of indirect price controls on domestic oil, since the levels of imports could be adjusted to offset or influence the allowables then set for production of oil in this country. Petrochemical companies also sought, and eventually obtained, access to the right to import foreign oil in order to bring their costs closer to the prices paid

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9/ Cabinet Task Force on Oil Import Control, The Oil Import Question, A Report on the Relationship of Oil Imports to the National Security, (1970).

10/ Id., p. 124.

by domestic and foreign competitors and to obtain the ability to import oil to manufacture export products in an effort to keep foreign markets.

In the early seventies, the prediction on world oil prices of the Task Force went out of the window. Foreign oil prices escalated sharply. Almost overnight, the issue became not how to get access to cheap foreign oil, but how to get access to cheap domestic oil if any oil at all. The Congress passed the Emergency Petroleum Allocation Act of 1973 and subsequent amendments, drastically adding to a bureaucracy which overlay and incorporated the oil import program. The result was a nightmare of price and allocation controls, with the subsidy aspects of both domestic and foreign oil largely allocated through an "entitlements" program which still lives on the in the Courts and before the Department of Energy.

In addition, empirical data indicates that an ominous long-term change in U.S. petrochemical producers' international market share of followed from increasing by quotas and fees U.S. petrochemical feedstock costs above those of foreign producers. New investment in the petrochemical industry shifted to areas having access to cheaper petrochemical feedstocks and in due course world market share shifted as well.

In the late 1950's, the United States' share of world chemical exports was 23%. 11/ In 1958, the Mandatory Oil Import Program was instituted, and oil imports into the United States were restricted until 1973. With the imposition of oil import controls, U.S. crude oil producers were partially insulated from price competition. With high feedstock costs in the U.S., and depressed crude oil and naphtha prices in world markets, it became cheaper to produce petrochemicals in Europe and Japan. This resulted in an extended period during which new investment was made in Europe and Japan beyond the needs of industry to meet local demands. From 1958 through 1970, European and Japanese chemical investments were 50% to 100% higher than U.S. levels, on the basis of investment per dollar of sales. 12/

This high level of investment lasted until 1971. In 1972, European sales of chemicals exceeded U.S. sales for

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11/ Trade Trends in Petrochemicals: 1983, A Report To The Petrochemical Energy Group, Arthur D. Little, Inc., August, 1984, pp. 18-19.

12/ The Impact of Changing U.S. Feedstock and Energy Costs on the Petrochemical Industry and the Economy, A Report to The Petrochemical Energy Group, Arthur D. Little, Inc., April, 1981, pp. 5-14. (A copy of this report is attached as a supplement to PEG's testimony.)

the first time. 13/ In this same year, the U.S. share of world chemical exports fell to 14%. 14/

To summarize our historical experience with crude oil and petroleum product quotas and fees (1) they generated an extensive, complex and inequitable governmental involvement in the producing, refining, and petrochemical industries; (2) they failed to prevent a growing U.S. dependence on foreign crude oil and refined products; (3) they forced capital investment in petrochemical facilities to be made outside the U.S. and subsequently the world market share of these foreign producers increased while U.S. market share declined.

Arbitrary and Unequal Impact of Import Fees

In May, 1973 the federal oil import quotas were replaced by fees on imported oil to restrain imports. Among the reasons for the ultimate abandonment of this approach was the difficulty in providing a mechanism for adjusting the impact of a fee on the export and domestic markets. This was so even though there was an elaborate formula in the entitlements program which took the import fee into consideration.

Assuming arguendo that the fee, if imposed today, would have no impact on domestic prices (a fallacious

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13/ Id.

14/ Trade Trends in Petrochemicals: 1983, supra, at p. 18.

assumption), how could there be equity in determining which class of consumers paid the fee? Under a quota system, at least the right to import could be issued in more or less equitable fashion to classes of customers, who could trade the rights for cash or kind; but, how is a similar result achieved when only the actual importer pays the fee?

If the answer is a rebate, who gets the rebate and who decides who gets the rebate?

And if a satisfactory solution can somehow be achieved, then remove the false assumption and find an equitable way for those who are not eligible for any rebates to offset the higher cost of domestic oil which will rise toward the artificially high price of imports.

Then, having solved this problem, the next step is to consider what to do about foreign consumer products or the raw materials for consumer products which can be imported, manufactured with foreign oil as the feedstock.

An oil import fee or quota necessarily includes a fee on imported petroleum products. Historically there has been a distinction between residual fuel oil and "finished" products and a recognition of the needs of petrochemical companies for "crude and unfinished oils." The 1970 Report succinctly described the last system in the following way: "The total amount available for allocation among petrochemical producers is determined--and varied--through what is, in effect, negotiation between the industry and government officials. The percentage varies from year to

year depending on the total available for allocation and the level of inputs." 15/

There is, of course, no indisputable basis for determining what product constitutes "crude oils and unfinished oils" and finished products when considering petrochemical feedstocks. Our recent experience in testifying before the International Trade Commission is instructive. Naphtha is a petrochemical feedstock; it is also used to make motor gasoline and other products. When naphtha is imported by a petrochemical company, would it be required to pay a fee? If this is an issue now under existing tariffs, think how serious the problem becomes with a fee. 16/

Current Import Pressures

In 1973, the U.S. imported 3 million B/D of petroleum products, or about 17 percent of total U.S. oil consumption. By 1984, petroleum product imports had declined to 2 million B/D, but more significantly, represented only 13 percent of U.S. oil consumption. 17/ Nearly 60 percent of these product imports come from U.S. possessions,

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15/ Id. p. 13.

16/ Testimony of the Petrochemical Energy Group, March 7, 1985, before the U.S. International Trade Commission, Investigation No. 332-203.

17/ Testimony of Danny J. Boggs, Deputy Secretary of Energy, Before The Environment, Energy and Natural Resources Subcommittee of the Committee on Government Operations, U.S. House of Representatives, April 2, 1985.

U.S.-owned refineries in the Caribbean, or from U.S. OECD allies. 18/ In 1984, total gasoline and gasoline blending components averaged 370,000 B/D, or 6 percent of the United States' total gasoline demand. 19/ Historical data indicates that imports of these light petroleum products actually tend to fluctuate more widely than product imports as a whole. 20/

A recent report prepared for the Department of Energy indicates that the rise in petroleum product imports since 1982 was in line with the general level of U.S. imports. 21/ We have seen a rising level of petrochemical imports, as the data attached to my study shows. Broad economic forces such as the strength of the dollar and of the U.S. economy compared to other economies are responsible

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18/ A more complete breakdown of these imports is as follows:

U.S. possessions or U.S.-owned refineries in the Caribbean	37%
Other OECD nations	21%
Venezuela	15%
Other OPEC	7%

The Changing Structure of World Refining Industry: Implications for U.S. Energy Security, Prepared by OPEC Downstream Project, Resource Systems Institute, East-West Center, Honolulu, Hawaii, For Presentation to the United States Department of Energy, January 23, 1985, at p. 30.

19/ Testimony of Danny J. Boggs, supra.

20/ The Changing Structure of World Refining Industry, supra, at p. 27.

21/ Id., at p. 25.

for these broad trends. The petroleum refining industry is not unique in facing pressure from imports.

Those in the independent petrochemical industry can sympathize with our colleagues in the refining industry faced with pressure from foreign producers. Indeed, the decline in our industry's favorable trade balance during 1983 and 1984 has been caused more by increased petrochemical imports into the U.S. than reduced exports. 22/ But the imposition of a crude oil or petroleum product import limitation will weaken the competitive position of the manufacturing industries downstream of crude oil and petroleum product production and very possibly force these other industries to come before you with their claims for protection.

The independent petrochemical industry joined many other industries in welcoming the termination of oil price and allocation controls, including the oil import program. It would be a drastic step backward into time and to reregulation of the energy and petrochemical industries to resurrect an import control program now.

22/ See, Trade Trends in Petrochemicals: 1983, p. 26.

THE IMPACT OF CHANGING U.S. FEEDSTOCK AND ENERGY COSTS ON THE PETROCHEMICAL INDUSTRY AND THE ECONOMY

A Report to

The Petrochemical Energy Group

April 1981

Arthur D Little, Inc.

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CHAPTER 1

SUMMARY

To better understand the significance of initiatives that will increase the cost of hydrocarbon energy and feedstock supplies in the United States to levels well above those experienced in other parts of the world, The Petrochemical Energy Group asked Arthur D. Little, Inc., to identify the consequences of such high-cost supplies to both the petrochemical industry and petrochemical-dependent sectors of the U.S. economy. In this assignment we have focused on the impact of higher energy and feedstock costs on petrochemical demand, investment, and trade, as well as the effect these changes might have on petrochemical-dependent industries. Assuming a 20-40% increase in energy and feedstock cost beyond that expected in the Base Case we found that by 1995:

- U.S. domestic demand for petrochemicals would be reduced as much as 15%;
- Petrochemical investment in the United States would likely be curtailed by 20%;
- The U.S. balance of trade in petrochemicals would decrease by 20%;
- The output of petrochemical-dependent industries would decline by as much as 8%.

For each factor we have estimated the dollar and percentage difference between the Base Case and the U.S. High Cost Energy Scenario in 1985, 1990 and 1995. The results of this analysis are shown in the summary Table.

To establish these estimates required a forecast of the U.S. economy that is consistent with both the energy and the feedstock price outlook. Such an internally consistent forecast was recently developed by the U.S. Department of Energy in the *Annual Report to Congress-1979* published in August 1980. Using this framework for our analysis we have focused primarily on establishing the long-range differential effects

of high-cost energy and feedstocks on both the petrochemical and petrochemical-dependent industries. Our analysis of petrochemical industry demand and investment effects has been set within the context of the international chemical industry growth in order to better appreciate the full magnitude of the changes on this worldwide industry.

SUMMARY TABLE

THE IMPACT OF HIGH COST ENERGY SUPPLIES ON PETROCHEMICALS AND PETROCHEMICAL DEPENDENT PRODUCTS
(billions of 1980 dollars)

	1985	1990	1995
Petrochemical Demand			
Base Case	95.5	140.9	194.5
U.S. High Cost Energy Scenario	84.1	124.9	166.4
Dollar Difference	11.4	16.0	28.1
Percent Change	11.9%	11.4%	14.4%
Petrochemical Investment			
Base Case	8.6	12.9	17.7
U.S. High Cost Energy Scenario	7.0	10.4	14.0
Dollar Difference	1.6	2.5	3.7
Percent Change	18.6%	19.4%	20.9%
Petrochemical Trade Balance			
Base Case	9.0	13.2	18.2
U.S. High Cost Energy Scenario	7.6	10.7	14.4
Dollar Difference	1.4	2.5	3.8
Percent Change	15.6%	18.9%	20.9%
Petrochemical Dependent Industry Shipments/			
Base Case	637.7	828.4	1036.1
U.S. High Cost Energy Scenario	607.0	781.5	955.5
Dollar Difference	30.7	46.9	80.6
Percent Change	4.8%	5.7%	7.8%

Source: Arthur D. Little, Inc., estimates.

CHAPTER II

INTRODUCTION

The objectives of this report are to identify:

- likely long-term consequences to the U.S. petrochemical industry of feedstock and energy costs controlled at levels well above those experienced in other countries.

- likely long-term effects on U.S. petrochemical-dependent industries of such shifts in the domestic petrochemical industry cost structure.

In this report we first examine the history of worldwide chemical investment and trade. Factors controlling worldwide investment in petrochemicals are explored to determine the likely impact of high-cost energy and feedstock supplies in the United States on petrochemical industry investments and foreign trade. The petrochemical industry is an international business. The past behavior of the worldwide petrochemical industry provides convincing evidence that the industry is alert to long-run structural changes in cost, technology, and national policies affecting its hydrocarbon feedstock and energy supplies. In the past the industry has responded to these changes by altering its worldwide investment patterns to improve its competitive cost position. We expect the industry to be motivated by these same factors in the future. In addition, a new element involving security of hydrocarbon supplies will play an increasingly important role in the investment decision process.

The impact of higher energy and feedstock costs for the U.S. petrochemical industry and those industries dependent on petrochemicals has been studied within an economic environment developed to match two different forecasts for world crude oil prices. In our analysis we have used as a Base Case the Middle World Oil Price forecast as set forth in the U.S. Department of Energy *Annual Report to Congress — 1979*. The High World Oil Price forecast in the Department of Energy report was used for U.S. energy costs in the U.S. High-Cost Energy Scenario outlined in this report. The U.S. High-Cost Energy Scenario assumes that world oil costs outside the United States will remain the same as in the Base Case.

Higher energy prices have a major impact on a wide variety of energy-intensive industries such as steel, aluminum, glass, pulp and paper, and chemicals. Many sectors of the economy identified as petrochemical-dependent industries in this report are also dependent on other energy-intensive raw materials. Thus, the loss in demand expected in key petrochemical-dependent industries reflects the impact of higher costs of all raw materials and energy consumed by that industry and a high-cost energy environment throughout the economy.

The key to our analysis is an examination of the changes in demand for petrochemical and petrochemical-dependent products in relation to GNP that occurred during two different periods of time. During the first period, from 1967 to 1973, energy costs were quite stable; during the second period, from 1973 to 1977, energy costs were rising rapidly. We have used the rate of change in demand growth between these two time periods as an indication of the sensitivity of various sectors of the economy to energy price changes. Our analysis suggests a very significant degree of sensitivity to energy cost changes on the part of the petrochemical and petrochemical-dependent industries. This is one approach to the problem. Much more extensive economic research into the impact of energy price changes on chemical industry growth is clearly warranted.

CHAPTER III

THE IMPORTANCE OF FEEDSTOCK COST IN PETROCHEMICAL DEVELOPMENT

The relationship between the development of the petrochemical industry and the availability of low-cost hydrocarbon feedstocks is often taken for granted. This report explores some aspects of this relationship, particularly the long-range implications of significant changes in relative hydrocarbon costs to geographical patterns of chemical and petrochemical industry investment and international trade. The implication of substantial short-term regional cost differentials for trade in petrochemicals is easy to understand. The long-range impact of structural cost differences between regions on investment and hence trade is not as well defined although the results in terms of investment patterns and trade trends are of far greater importance.

The fundamental proposition of this report is that long-term changes in the petrochemical industry cost structure will significantly affect investment decisions regarding new plant location. In turn, investment trends will have substantial impact on regional production and foreign trade. A review of chemical and petrochemical industry behavior confirms that when confronted with perceived long-term cost differentials, as the industry was between 1958 and 1973, the companies shifted investment patterns, and this subsequently altered long-term production and foreign trade. If the industry is again confronted with long-term changes in costs, major shifts in investment, production, and trade can be expected.

A. PETROCHEMICAL COSTS AND INVESTMENT PATTERNS — A HISTORY

The petrochemical industry was founded on the U.S. Gulf Coast where there was an abundant supply of natural gas liquids (ethane, propane, and butane), which could easily be cracked to produce primary petrochemicals such as ethylene, propylene, and butadiene. Worldwide demand for petrochemical derivatives in plastics, fibers, rubbers, and other essential products expanded rapidly in the decade after World War II. However, Europe and Japan did not have indigenous supplies of natural gas liquids at the time, so other raw materials were needed.

Because of significantly lower gasoline demand and high fuel oil utilization in Europe and Japan, refiners in these two areas had major surpluses of naphtha available. Introduction of naphtha cracking technology for petrochemical production in the 1950's brought the petrochemical industry to both Europe and Japan.

As the petrochemical industry expanded worldwide in the early 1960's, it became clear that the U.S. supplies of gas liquids were limited and that long-term growth of the U.S. industry would also require cracking of heavy liquids such as naphtha in the United States. Because of high gasoline demand in the United States, naphtha was not available, and though technology for cracking even heavier fractions such as gas oil was developed, there was little hope at that time that the United States could remain cost competitive with Europe in petrochemicals. A number of factors contributed to this conclusion. First, U.S. crude oil exploration and production costs were several times higher than the costs in other parts of the world. Second, U.S. government policy was strongly protective of U.S. crude oil producers through the imposition of oil import controls. The cost difference between domestic and foreign crude was as high as 33% under the Mandatory Oil Import Program that was instituted in 1958 and restricted oil imports until 1973.

Faced with high-cost U.S. crude oil and petroleum products that were protected by U.S. policy and depressed crude oil and naphtha prices in world markets, most participants in the petrochemical industry came to the conclusion during the early 1960's that in the long run it would be cheaper to produce petrochemicals in Europe and Japan than in the United States. The successful formation of the Common Market during this period reinforced the desirability of European investment. The result was an extended period of investment beyond the needs of the industry to meet local demand in Europe and Japan. This high level of investment lasted until 1971.

On a worldwide basis the only consistent set of sales, investment, and trade statistics available is that for the total chemical industry. In the United States the petrochemical industry accounts for about 45% of total chemical industry sales, some 60% of chemical industry investments in new plant and equipment, 55% of U.S. chemical exports, and 60% of the overall chemical industry trade surplus. Since petrochemicals constitute such a large fraction of industry operations, the

trends identified for the chemical industry are also believed to be representative of the petrochemical sector. Because the petrochemical sector is growing faster than other segments of the industry, the trends for chemical industry investment probably understate the actual worldwide petrochemical investment changes.

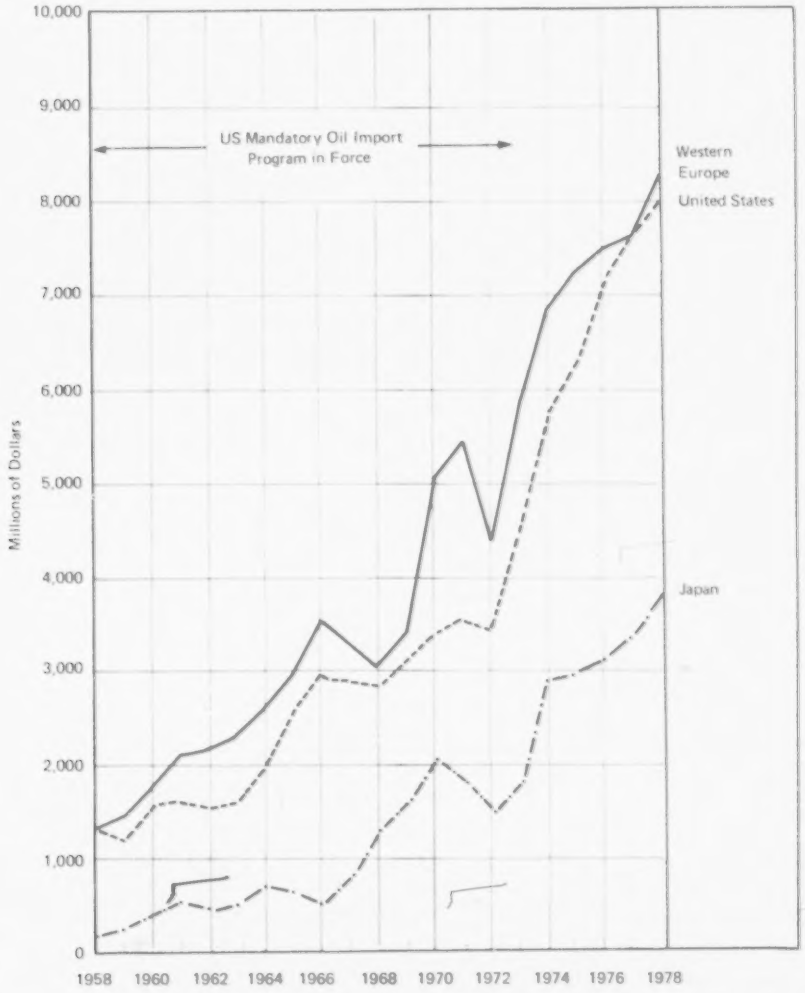
The history of worldwide chemical industry investment and sales from 1958 through 1978 is shown in Figures 1 and 2. When annual investment data is divided by sales to determine an investment-to-sales ratio, it becomes clear that from 1958 through 1970 Europe and Japan (Figure 3) were committing a much higher fraction of annual sales revenue to new investment than the United States.

On the basis of investment per dollar of sales, European and Japanese chemical investments were typically 50-100% higher than U.S. levels for more than a decade. The results of this heavy investment program slowly shifted the balance of sales among the three regions. European sales exceeded U.S. sales for the first time in 1972. Devaluation of the dollar during the 1970's accelerated the reported growth in the dollar sales of European producers. The combined effect of heavy investment and devaluation left the United States well behind Europe in total dollar sales by 1978. Detailed statistics on investment and sales are shown in Appendix A.

In 1970 U.S. crude oil production peaked and started to decline. In this environment crude oil imports could no longer be constrained, and in 1972 and 1973 the limitations on oil imports were slowly dismantled. By the time of the Arab embargo in October 1973, accelerating U.S. oil imports had brought world supply/demand for crude oil into balance. This made possible the world crude oil price increases of December 1974. Because U.S. price controls were in force at the time, world prices for crude oil and petroleum products exceeded U.S. prices for the first time. This reversal caused a substantial change in the relative competitive cost position of the U.S., European, and Japanese petrochemical industries. The turmoil in world energy markets came to a head in 1973. However, it had begun to affect world chemical investments as early as 1971 when there was a precipitous drop in European and Japanese investment per dollar of sales as shown in Figure 3.

Because of the uncertainty in world energy supplies, no major new trend in worldwide chemical investments has developed to favor one region over others. In the short term U.S. price controls provided lower

Figure 1. Annual Chemical Industry Investment in Western Europe, Japan, and the United States, 1958-1978

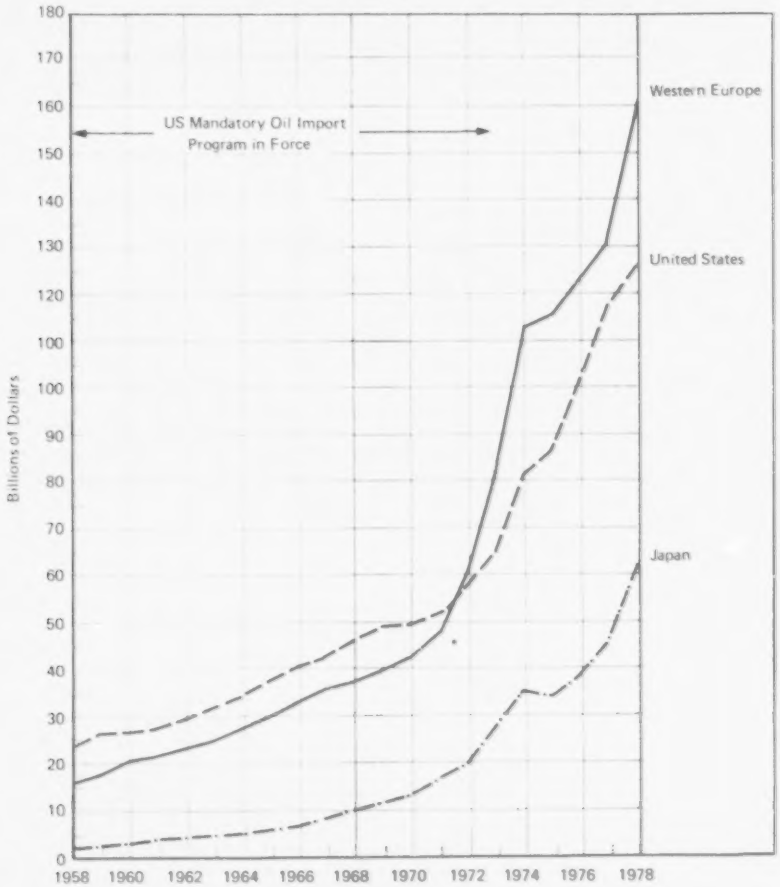


Notes: 1. The OECD definition of the Chemical Industry excluded synthetic fibers and synthetic rubber through 1969. Synthetic fibers were included starting in 1970.

2. 1958–1967 estimates based on investments of eight major producing countries representing 95% of industry investment annually.

Source: *The Chemical Industry*, published annually by the Organization for Economic Cooperation and Development

Figure 2. Sales Value of Chemical Industry Production in Western Europe, Japan, and the United States, 1958-1978



Note: The OECD definition of the Chemical Industry excluded synthethic fibers and synthetic rubber through 1969. Synthetic fibers were included starting in 1970. Sales data includes exports.

Source: *The Chemical Industry*, published annually by the Organization for Economic Cooperation and Development.

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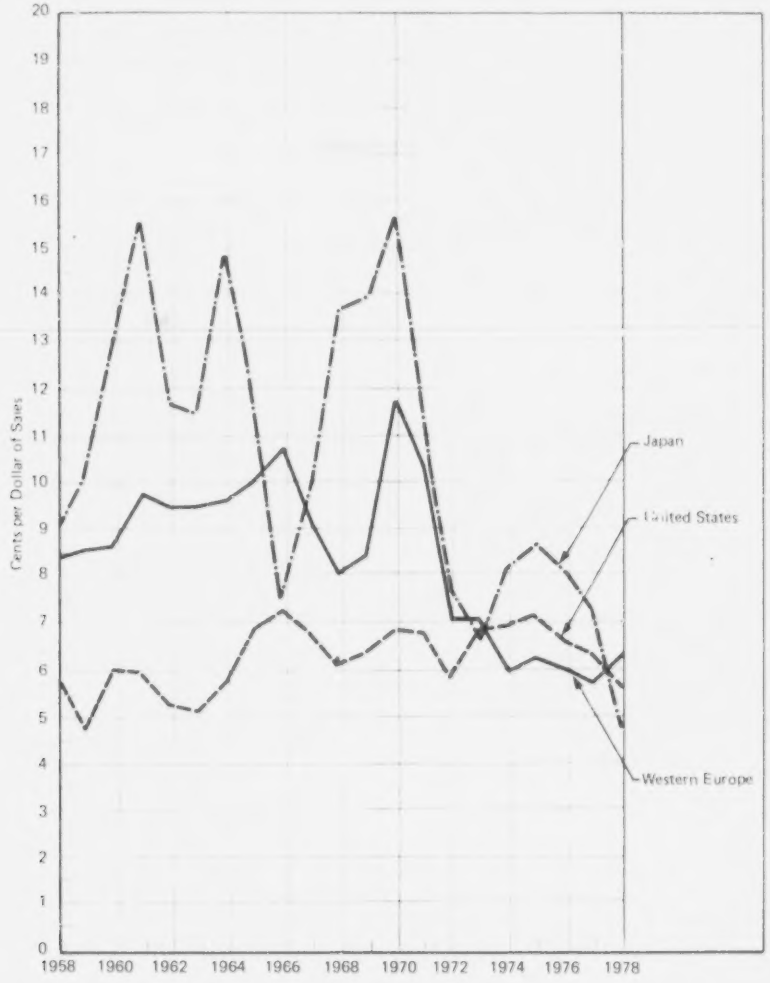
Figure 3. Annual Chemical Industry Investment per Dollar of Annual Sales, Western Europe, Japan, and the United States, 1958-1978



Source: *The Chemical Industry*, published annually by the Organization for Economic Cooperation and Development

costs in the United States than in Europe or Japan, but this did not have any significant impact on investment or trade until the cost gap widened substantially in 1979. With U.S. crude oil prices already decontrolled and decontrol of natural gas prices now proceeding, U.S. energy and feedstock costs will equilibrate with those of Europe and Japan during the 1980's. This price equilibrium presumes no further interference with hydrocarbon market values by the United States or other governments.

In retrospect, the higher costs of petroleum-based energy and feedstocks in the U.S. market over the 1958-1973 period under the Mandatory Oil Import Program had a significant long-term impact on U.S. and worldwide chemical investment. Any new long-range initiatives having a major impact on U.S. energy and feedstock costs can be expected to have an equally important effect on U.S. petrochemical investment programs. Thus, long-range energy policy decisions need to be examined for the impact on industries such as petrochemicals, which are heavily dependent on oil, natural gas, and natural gas liquids feedstocks and fuels.

B. FACTORS CONTROLLING PETROCHEMICAL INVESTMENT

Many factors affect investment decisions for new petrochemical plants. The judgments on those factors that lead to the selection of one region over another for a new plant site are complex and are not consistently applied among various companies. Thus, no attempt to evaluate and weigh these factors can be fully representative. However, to identify which regions of the world were more attractive for petrochemical investments and thus to anticipate where petrochemical investment might accumulate, Arthur D. Little developed a matrix table reflecting our analysis of the situation in the spring of 1966. This table was contained in a report, entitled "Oil Import Quotas and the U.S. Balance of Payments in Petrochemicals." It confirmed the relative attractiveness of Europe and Japan for future petrochemical investment and highlighted the changing U.S. and European cost positions in petrochemicals. (See Appendix B.)

The criteria chosen for the investment rating system in 1966 were:

- Economies of Scale
- Relative Manufacturing Cost
- Government Incentives
- Political Stability

- Tariff Protection
- Extent of Competition
- Economic Stability
- Exporting Know-How

The 1966 report focused on the importance of providing "100% quotas" or "free access" for naphtha feedstocks used in the production of petrochemicals. Since imports of these heavy liquid feedstocks were restricted under the Mandatory Oil Import Program (MOIP), which was then in effect, U.S. producers did not have access to these key petrochemical feedstocks at the same low cost as producers in Europe and Japan. Because petrochemical production costs were perceived to be lower outside the United States, many new investments were made abroad rather than in the United States. The conclusions of this report were that without substantial naphtha quotas in the range of 50-100% of feedstock requirements:

- U.S. petrochemical investment would stagnate,
- U.S. producers would invest heavily abroad to maintain their competitive position; and
- the U.S. petrochemical trade balance would suffer because of an increase in imports relative to exports.

The concept of "free access" was not incorporated into the MOIP until 1972. The turn of events from 1972 until the present has put the United States in a much stronger competitive cost position in petrochemicals vis-a-vis the Europeans and Japanese.

The questions are: What actually happened from 1966 to 1972 while the U.S. petrochemical industry was forced to operate with restricted access to low-cost heavy liquid feedstocks, and what has happened since 1972 after the U.S. industry achieved "free access" and had a modest competitive cost advantage? Looking at the historical facts, did the change in the competitive cost position of the U.S. petrochemical industry attract new investment and shift the U.S. petrochenical trade balance?

Fortunately, statistics on the U.S. petrochemical industry investment, sales, and foreign trade are available, and it is possible to identify the impact of changes in world hydrocarbon costs on the U.S. petrochemical industry during these time periods.

As noted earlier, the Arthur D. Little report suggested that, without "free access," the U.S. petrochemical industry would shift its investment attention abroad, and U.S. petrochemical investment levels would not increase from 1965 to 1970. In fact, there was a significant increase in U.S. petrochemical investment in 1966, but then U.S. petrochemical investment actually did level off. (See Figure 4 and Appendix C.) Total U.S. petrochemical investment in 1966 was $1.7 billion and was still the same four years later in 1970. Investment interest in the petrochemical industry did not pick up again until after 1973. In constant construction cost dollars, the 1966 investment peak was not exceeded until 1974.

The shift in investment interest in the U.S. petrochemical industry between the 1965-1972 period, when the MOIP was in force, and the 1972-1978 period, when the United States had free access and a stronger competitive cost position, was quite dramatic and confirms the change in perception by industry management about the future of the U.S. industry.

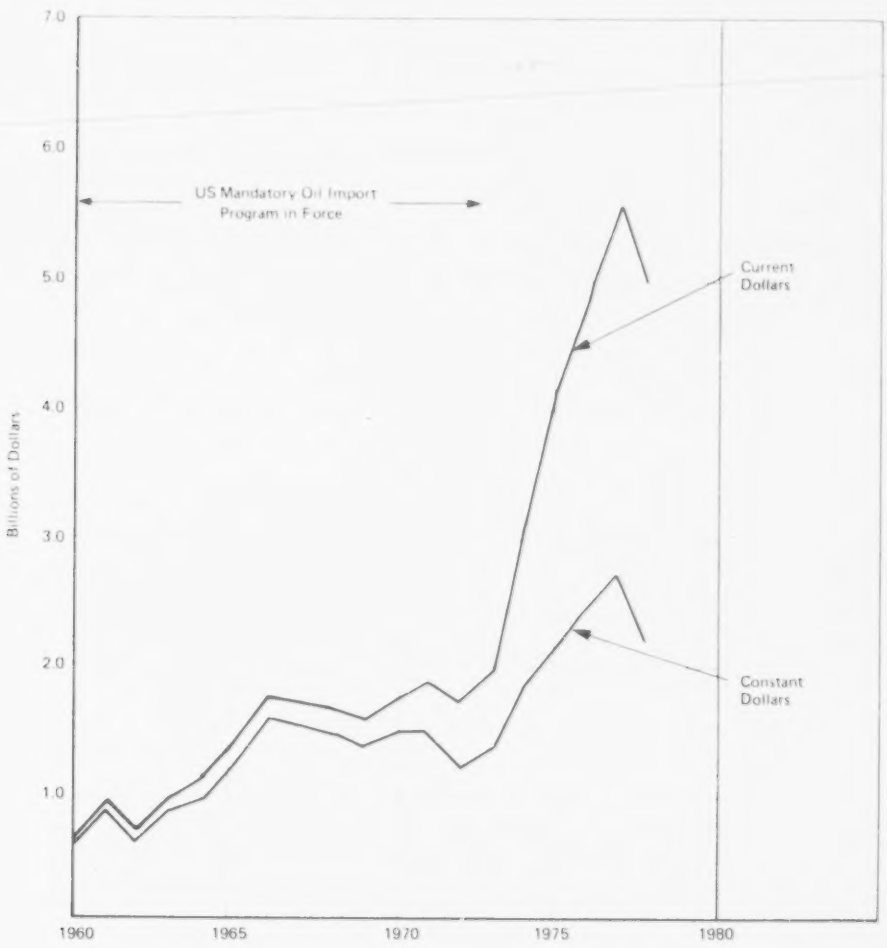
Annual Growth in U.S. Petrochemical Investment — 1965-1978
(percent per year)

Time Period	Current Dollars	Constant Construction Cost Dollars
1965-1972	2.1%	- 1.8%
1972-1978	20.4%	11.4%

The data in Appendix C from which these percentages are derived clearly show 1972 as the low year and the dividing point between a period of stable to declining U.S. petrochemical investment and a higher investment growth time span during the next six years.

One of the key conclusions of the 1966 report was that if investments were not made in the United States by American companies, they would be made abroad. While no definitive data are available on foreign investment in petrochemicals by U.S. companies, information is available on the total chemical industry. In fact, the data reported by the U.S. Government on foreign direct investment by U.S. chemical companies suggest that overseas investment increased from 24% of total U.S. and overseas investment in 1966 to a peak of 31% in 1972. The share of total spending that has gone abroad has been declining slowly ever since, in 1978 it was estimated at 25% of total investments.

Figure 4. Annual U.S. Petrochemical Industry Expenditures for New Plant and Equipment



Source: U.S. Department of Commerce, Annual Survey of Manufactures.

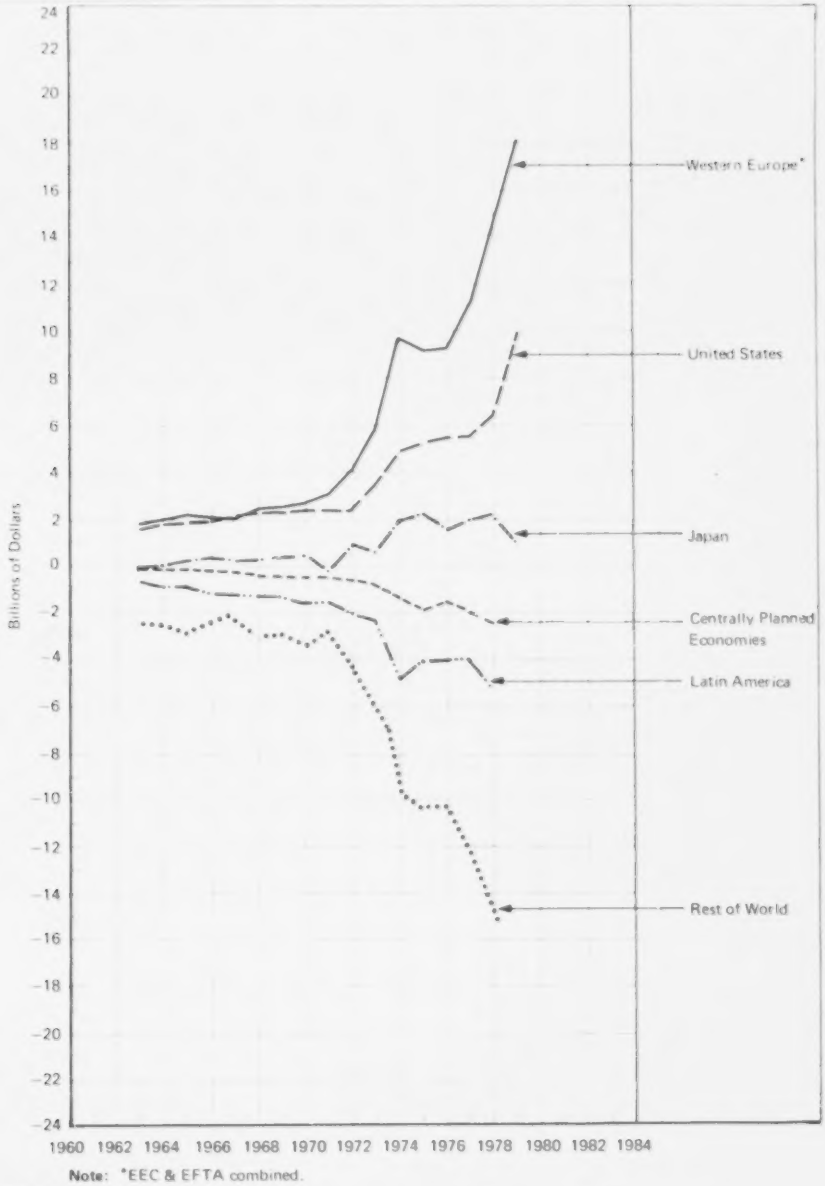
C. PETROCHEMICAL INVESTMENT AND FOREIGN TRADE

As noted earlier, a key part of the proposition being examined is the impact of long-term shifts in industry costs on investment and foreign trade. There is strong evidence that structural changes in costs will shift investment patterns. There is equally strong evidence that long-term investment in new capacity above that required to supply domestic demand has significant impact on foreign trade. The United States and Europe are both good examples of the impact of two different investment trends on foreign trade. After more than a decade of investing at a level that appears to have been beyond its domestic needs, Europe has now taken a formidable lead in net exports of chemicals. By contrast, the lower level of U.S. investment in chemicals during the same time period (1958-1972) left the United States with plant capacity much more balanced in relation to domestic markets and thus with less potential for exports. The change in net trade since 1970 for these two regions confirms this theory. In 1970, net exports for the U.S. and Europe were about equal at $2.6 billion per year. By 1979, European net exports equaled $18 billion per year while the U.S. balance of trade in chemicals was just under $10 billion. The impressive and continuing strength of European net exports is shown in Figure 5 and Appendix D.

These data show that European success in net exports did not come until after 1970-1972. Perhaps the best explanation is that the growth in the European market took up most of the new capacity as it was installed during the 1960's, but when European market growth slowed down in the early 1970's, there was no other way to utilize the new capacity as it came on stream except in exports. Furthermore, investment decisions in chemicals have a three- to five-year implementation delay associated with plant construction time. Thus, it was several years before new plants already committed before the Arab embargo actually were completed and directly affected industry operating rates. The dominance of Europe in today's world net export market for chemicals and its very favorable balance of trade position are clearly the result of an ambitious investment program during the dozen years from 1958 to 1970.

Although world data on petrochemical trade is not readily available, a close look at the U.S. petrochemical trade situation is possible. In this analysis we have reviewed the U.S. petrochemical trade balance for the 1972-1978 period and compared it to the earlier data on a constant dollar basis as follows:

Figure 5. Balance of Trade in Chemicals (SITC, Revised, 5), 1963-1978/9



Note: *EEC & EFTA combined.

Source: United Nations Monthly Bulletin of Statistics

Annual Growth in the U.S. Balance of Trade in Petrochemicals — 1965-1978
(percent per year based on constant dollars)

Time Period	Exports	Imports	Trade Balance
1965-1972	5%	20%	– 1%
1972-1978	10%	6%	13%

The change in growth rate for imports, exports, and the balance of trade experienced during these two different eras of relative competitiveness for the U.S. petrochemical industry is both striking and consistent with the thesis presented in this report. Clearly, the change in competitive cost position of the U.S. petrochemical industry had a major impact on the balance of trade in petrochemicals.

D. CONCLUSIONS

Two cause-and-effect relationships have been proposed with supporting data:

Proposition — A long-term shift in energy and feedstock costs will affect petrochemical plant location decisions.

Confirmation — The U.S. set out in 1958 to protect domestic energy markets from low-cost foreign crude oil through oil import controls. Capitalizing on low-cost naphtha in world markets, Europe and Japan were recognized as the lowest-cost producing points for petrochemicals from 1958 through 1972. In this environment investments were made in Europe and Japan at a level well beyond that required to meet domestic requirements. In the high-cost U.S. environment, capacity was installed primarily to match market growth.

Proposition — Long-term investment trends change the structure of the industry worldwide, affecting both share of world market and long-term trends in world trade.

Confirmation — Investment in Europe and Japan beyond local consumption requirements led to increased pressure on producers to export; the substantial growth in Europe's positive balance of trade thus can be traced to a long period of investments made in capacity beyond domestic market demand.

CHAPTER IV

THE IMPACT OF HIGH-COST ENERGY AND FEEDSTOCK SUPPLIES ON FUTURE U.S. PETROCHEMICAL DEVELOPMENT

The United States has recently decontrolled the price of oil and proposals are pending for the accelerated decontrol of gas prices. It is presumed that in time this process will place the United States in equilibrium with world hydrocarbon values. However, there are a number of indications that U.S. energy policy could become protectionist again when this equilibrium is achieved. For example, domestic refiners are currently seeking protection from future flows of imported petroleum products. Likewise, the passage of the Synthetic Fuels Act suggests the U.S. Government is prepared to subsidize high-cost energy alternatives in hopes of reducing reliance on imported oil. If the output of these plants is threatened in the marketplace, further protection in the form of increased tariffs or other types of controls on imports may be forthcoming. Thus, it is not difficult to envision the circumstances which would recreate the relatively high-cost U.S. crude oil environment that existed under the Mandatory Oil Import Program from 1958 to 1973.

Should a high-cost U.S. energy and feedstock environment return, the question that the petrochemical industry must ask itself is, "how competitive will U.S. plants be compared to facilities in other parts of the world?" Assuming that U.S. government policy decisions force energy and feedstock costs for the U.S. petrochemical industry to levels well above Western European and Japanese producers for the long-term, the answer will be the same as before — the U.S. will not be fully competitive! Thus, the trends in evidence before the Arab embargo would likely be reestablished.

A. TWO SCENARIOS FOR THE FUTURE

Given both decontrol and an increasing desire for protection of U.S. energy interests, two scenarios emerge for the future development of the chemical and petrochemical industries:

- *Base Case* — This scenario presumes the U.S. energy and feedstock costs are in equilibrium with other areas of the world.

- *U.S. High Cost Energy Scenario* — The second scenario is based on a relatively high-cost energy and feedstock outlook for the U.S.

The key questions are then focused around the outlook for crude oil prices and economic growth as well as chemical and petrochemical demand, investment, and foreign trade. The development of the forecasts for these factors requires a large number of sequential steps. To assist in understanding the flow of our analysis, we have prepared Figure 6. The analysis starts with the two energy and economic forecasts and, through the use of an energy sensitivity evaluation, proceeds to a determination of two separate forecasts of U.S. and world petrochemical consumption growth. The difference in U.S. petrochemical consumption between the two cases is the first finding of our study.

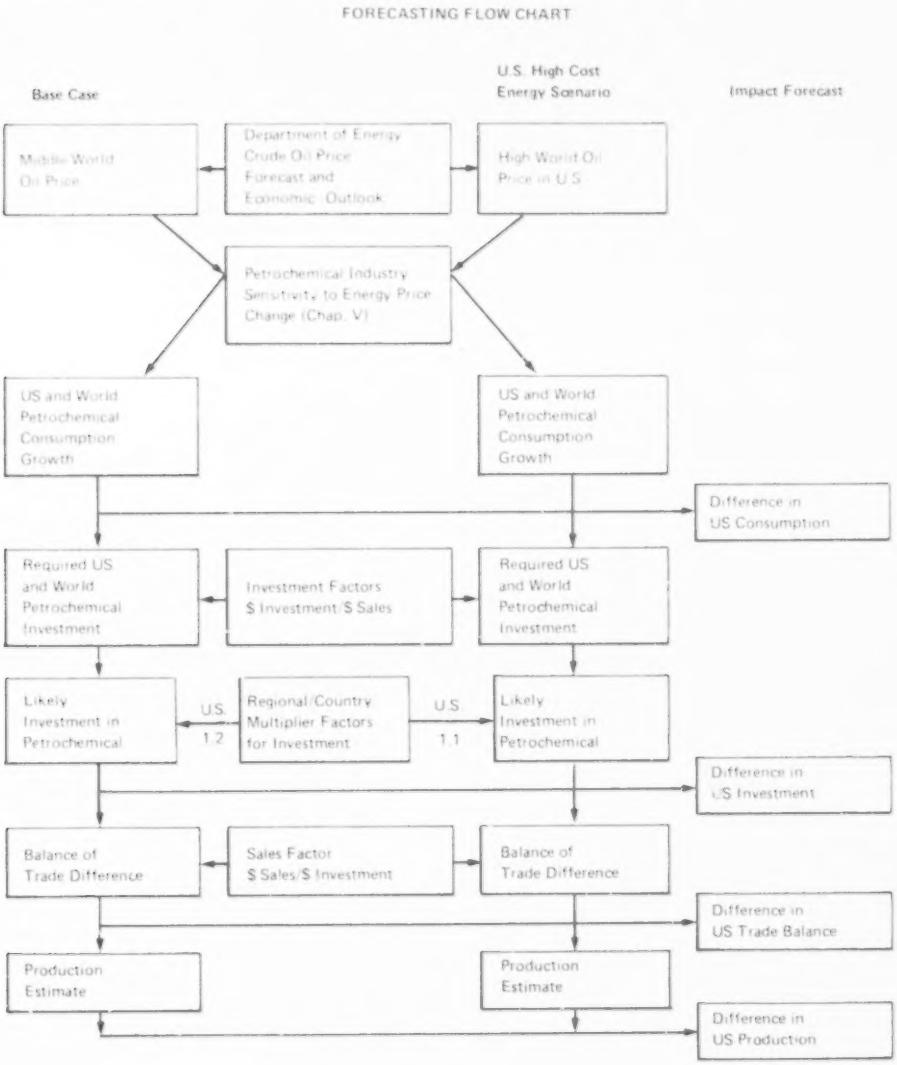
Using domestic demand data for the two scenarios as a base, an estimate for the investment required in each region is developed through the use of investment factors. These factors are based on the annual level of investment needed to meet sales of different types of chemical and petrochemical products. Because the chemical industry does not find it equally attractive to invest in all areas of the world, the likely investment pattern will be skewed by comparison to the level of investment required to meet regional consumption. A regional multiplier factor for new investment has been used to adjust the required investment to the likely investment pattern. The difference in U.S. petrochemical investment resulting from the two scenarios is the second key finding of this study.

Differences in investment leads to differences in ability to export. Thus, the third conclusion of our report results from a forecast of the differences in petrochemical trade likely under the two scenarios. Given forecasts of U.S. consumption and net trade, petrochemical production under the two scenarios can readily be calculated.

B. CRUDE OIL PRICES

There is considerable speculation as to the future of world crude oil prices, and in today's environment, most forecasts are out of date almost as soon as they are published. For this analysis we have chosen to use the Middle World Oil Price and High World Oil Price forecasts as

Figure 6. Impact of U.S. High Cost Energy Scenario on the U.S. Petrochemical Industry


FORECASTING FLOW CHART
Base Case
U.S. High Cost Energy Scenario
Impact Forecast
Middle World Oil Price
Department of Energy Crude Oil Price Forecast and Economic Outlook
High World Oil Price in U.S.
Petrochemical Industry Sensitivity to Energy Price Change (Chap. V)
US and World Petrochemical Consumption Growth
US and World Petrochemical Consumption Growth
Difference in US Consumption
Required US and World Petrochemical Investment
Investment Factors $ Investment/$ Sales
Required US and World Petrochemical Investment
Likely Investment in Petrochemical
U.S. 1.2
Regional/Country Multiplier Factors for Investment
U.S. 1.1
Likely Investment in Petrochemical
Difference in US Investment
Balance of Trade Difference
Sales Factor $ Sales/$ Investment
Balance of Trade Difference
Difference in US Trade Balance
Production Estimate
Production Estimate
Difference in US Production

Source: Arthur D. Little, Inc.

outlined in the U.S. Department of Energy *Annual Report to Congress-1979*, published in August 1980. These forecasts are shown in Table 1 and suggest a very rapid world crude oil price rise through 1985 for both cases with much lower increases through 1995. For this study, we have assumed that the Middle World Oil Case represents our Base Case environment worldwide. The High World Oil Price case has been used in this report to reflect a scenario *for U.S. prices only*. The U.S. High-Cost Energy Scenario presumes that the rest of the world would still enjoy crude oil prices suggested by the Base Case. The Department of Energy forecast anticipates significant changes in the crude oil pricing environment over time, which creates a 19-22% difference between the Medium and High Case through 1990. From 1990 to 1995 they expect a more rapid acceleration of crude prices in the High Case, which creates a difference of 37% between the two forecasts by 1995. Thus, in this report we have explored the impact of U.S. crude oil prices that range from about 20% to nearly 40% higher than U.S. price levels over the next 10-15 years.

C. ECONOMIC FORECASTS

A key reason for using the Department of Energy forecasts for our study is that their long-range outlook for the U.S. economy is consistent with the crude oil price forecast. The economic forecasts as shown in Table 2 suggest only a small difference in the change in real GNP growth between the two crude oil price cases. However, these differences do become significant for those sectors of the economy that are sensitive to energy price levels. According to the DOE forecast, the net result of higher energy prices and lower GNP growth is a drop of 2.2% in gross energy consumption.

D. CHEMICAL AND PETROCHEMICAL DEMAND GROWTH

Using the crude oil pricing environment and the economic growth projections for the Base Case as a guide, Arthur D. Little, Inc., has developed a forecast of the likely growth of the world chemical industry over the next 15 years. As shown in Table 3, this forecast anticipates a lower growth through 1985 than is anticipated from 1985 through 1990, because the world economy will be growing rather slowly during the near term as it absorbs the higher energy price increases of 1979-80. The forecast is broken down by world region so that it will be possible to establish regional investment levels compared to expected demand growth.

TABLE 1

GROWTH IN U.S. CRUDE OIL PRICES
($/Barrel)

Year	Base Case*	U.S. High Cost Energy Scenario**
I. Constant Dollars Price Forecast (1979 dollars)		
1977	17	17
1985	32	39
1990	37	44
1995	41	56
II. Rate of Real Price Increase (%/year)		
1977–1985	8.5	11.2
1985–1990	3.0	2.4
1990–1995	2.1	4.9
III. Current Dollar Price Forecast		
1985	51	63
1990	82	97
1995	118	160

* U.S. Department of Energy middle world oil price forecast.
** U.S. Department of Energy high world oil price forecast.

Source: U.S. Department of Energy – Annual Report to Congress – 1979, Volume Three, page 10.

TABLE 2

U.S. CRUDE OIL PRICE AND ECONOMIC GROWTH FORECASTS

ITEM	Base Case*			U.S. High-Cost Energy Scenario**		
	1985	1990	1995	1985	1990	1995
Crude Oil Price (1979 $/bbl)	32	37	41	39	44	56
Real GNP (billion 1979 dollars)	2718	3159	3569	2696	3116	3501
Annual GNP Growth Rate (78/85, 85/90, 90/95)	2.33	3.05	2.47	2.21	2.94	2.36
Implicit Price Deflator for GNP (1972 = 100)	2.64	3.64	4.73	2.69	3.70	4.81
Unemployment Rate (%)	7.1	6.0	5.9	7.4	6.4	6.4
Gross Energy Consumption (quadrillion BTU)	81.4	88.9	96.3	80.5	87.7	94.2

* U.S. Departmnet of Energy middle world oil price forecast.
** U.S. Department of Energy high world oil price forecast.

Source: U.S. Department of Energy – Annual Report to Congress – 1979, Volume Three, page 141.

TABLE 3

GROWTH IN WORLD CHEMICAL CONSUMPTION BY REGION, 1978–1995
(billions of 1978 dollars)

	1978	1978–1985 Growth (%/year)	1985	1985–1990 Growth (%/year)	1990	1990–1995 Growth (%/year)	1995
United States	120	4	158	6	211	5	270
Canada	7	7	11	6	15	5	19
Mexico	3	10	6	9	9	6	12
North America	130		175		235		301
Brazil	6	11	12	8	18	6	25
All Other South America	7	10	14	8	20	6	27
South America[1]	13		26		38		52
EEC	122	3	150	5	191	4	232
Other Western Europe	25	7	40	6	54	5	69
Western Europe	147		190		245		301
Saudi Arabia	1	15	3	10	4	7	6
Other Middle East	3	12	7	9	10	6	14
North Africa	1	6	2	6	2	5	3
Other Africa	8	10	16	8	23	6	31
Middle East and Africa	13		28		39		54
Japan	60	4	80	6	107	5	137
China (PRC)	4	12	9	10	14	7	20
Southeast Asia and Korea[2]	8	9	15	8	21	7	30
India and Other Asia	2	7	3	6	4	5	6
Australia and New Zealand	5	10	10	6	13	4	16
Asia and Pacific	79		117		159		209
USSR	45	7	72	6	97	5	123
Other Eastern Europe	23	7	37	5	47	5	60
Eastern Europe	68		109		144		183
TOTAL	450	5.3	645	5.9	860	5.0	1100

Note: Growth includes 1-1.5%/year real price increase and 4-5%/year volume increase for worldwide chemical sales.

1. Also includes Central America.
2. Also includes Taiwan.

Sources: OECD; United Nations; and Arthur D. Little, Inc., estimates.

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To determine the likely growth of the petrochemical industry, total world demand has been disaggregated by product group in Table 4. The petrochemical sectors are isolated and compared against industry growth for the Base Case in Table 5.

Because changes in energy costs in the United States are the focus of our alternate scenario we have developed a much more detailed analysis of the impact of energy cost changes on the petrochemical industry in the United States. Using the experience gained during the past decade we have examined the rate of change in petrochemical demand that occurred during periods of price stability, such as from 1967 through 1973, and in periods of high energy price change from 1973 to 1977. This analysis is documented in Chapter V and summarized in Figure 7. It suggests that there is significant petrochemical growth lost during periods of high energy price change. Consumption growth slows primarily because of the slowdown in substitution of synthetics for natural materials, which occurs at that time. Using this more detailed look at the petrochemical industry in the United States, we have forecast both U.S. and world growth in chemicals and petrochemicals as noted in Table 6. The growth rates derived from this analysis are shown in Table 7 for both the Base Case and the U.S. High-Cost Energy Scenario. Of particular interest is the higher growth rate for petrochemicals in the 1985-1990 time period for the U.S. High-Cost Energy Scenario compared with the Base Case. The reason for this is the slightly higher increase in energy costs for the Base Case during the middle years of the forecast.

E. CHEMICAL AND PETROCHEMICAL INVESTMENT FORECAST

The world growth in chemical consumption is monitored closely by industry management. As a result, we expect investments will be made to provide capacity for satisfying world consumption growth. This capacity will not be geographically distributed in the same manner as demand nor will it be installed at just the right time to match swings in world demand growth. However, to establish a preliminary basis for estimating capital investment for the chemical and petrochemical industry, we have examined past U.S. spending patterns and evaluated the annual level of investment per dollar of sales for each of the major sectors of the industry in the United States and used this factor in conjunction with product consumption forecasts to estimate required

TABLE 4

GROWTH IN WORLD CHEMICAL CONSUMPTION BY SECTOR 1978–1995
(billions of 1978 dollars)

	1978	1978–1985 Growth (%/year)	1985	1985–1990 Growth (%/year)	1990	1990–1995 Growth (%/year)	1995
Organic Chemicals	95	5	134	6	180	5	230
Plastic Materials	45	7	72	8	105	6	140
Man-Made Fibers	25	4	33	4	40	3	47
Synthetic Rubber	7	2	8	2	9	2	10
Agricultural Chemicals	40	4	53	4	64	3	74
Drugs	60	7	96	7	135	6	180
Soap, Detergents, and Toilet Goods	40	5	56	5	71	4	87
Paint	25	3	31	3	36	3	42
Inorganic Chemicals	35	4	46	5	59	4	72
Miscellaneous	78	6	116	7	161	6	218
TOTAL	450	5.3	645	5.9	860	5.0	1100

Note: Growth includes 1-1.5%/year real price increase and 4-5%/year volume increase for worldwide chemical sales.

Source: Arthur D. Little, Inc., estimates.

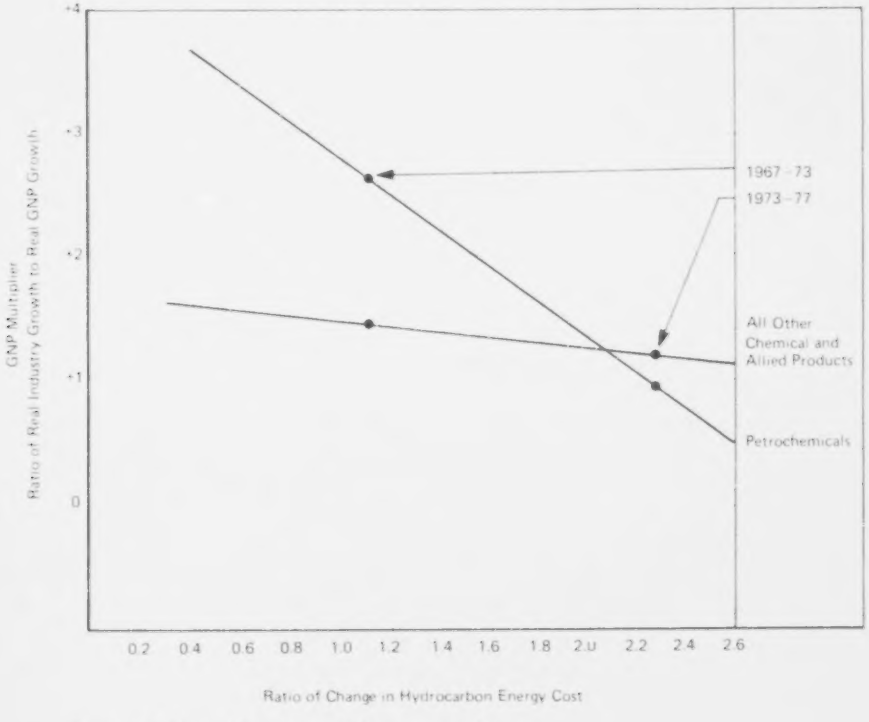
TABLE 5

GROWTH IN WORLD PETROCHEMICAL CONSUMPTION BY SECTOR 1978–1995
(billions of 1978 dollars)

Base Case	1978	Growth Rate %/yr.	1985	Growth Rate %/yr.	1990	Growth Rate %/yr.	1995
Organic Chemicals	95	5	134	6	180	5	230
Plastics	45	7	72	8	105	6	140
Fibers	25	4	33	4	40	3	47
Rubber	7	2	8	2	9	2	10
All Other Petrochemicals	20	5	28	6	37	6	46
Total Petrochemical Consumption	192	5.3	275	6.2	371	5.0	473
Total Chemical Consumption	450	5.3	645	5.9	860	5.0	1100
% Petrochemical	43		43		43		43

Source: Arthur D. Little, Inc., estimates.

Figure 7. Impact of Changing Energy Cost on Petrochemical and All Chemical and Allied Products



Source: U.S. Census of Manufactures; U.S. Department of Energy.

TABLE 6

OUTLOOK FOR UNITED STATES AND WORLD
PETROCHEMICAL AND CHEMICAL CONSUMPTION TO 1995
(billions of 1978 dollars)

	1978	1985	1990	1995
Petrochemical Consumption				
Base Case				
United States	54	73	108	149
Rest of World	138	202	263	324
World Total	192	275	371	473
U.S. High-Cost Energy Scenario				
United States	54	64	95	127
Rest of World	138	202	263	324
World Total	192	266	358	451
Consumption Lost in the U.S. High-Cost Energy Scenario	—	9	13	22
Chemical Consumption				
Base Case				
United States	120	158	211	270
Rest of World	330	487	649	830
World Total	450	645	860	1100
U.S. High-Cost Energy Scenario				
United States	120	147	195	242
Rest of World	330	487	649	830
World Total	450	634	844	1072
Consumption Lost in the U.S. High-Cost Energy Scenario	—	11	16	28

Source: Arthur D. Little, Inc., estimates.

TABLE 7

COMPARISON OF UNITED STATES AND WORLD
GROWTH RATES FOR PETROCHEMICAL AND CHEMICAL
INDUSTRY CONSUMPTION 1978–1995
(percent per year)

	1978–1985	1985–1990	1990–1995
Petrochemicals			
–Base Case			
United States	4.4	8.1	6.7
World	5.3	6.2	5.0
–High Energy Cost Scenario			
United States	2.5	8.2	6.0
World	4.8	6.1	4.7
Chemical Industry			
–Base Case			
United States	4.0	6.0	5.1
World	5.3	5.9	5.0
–High Energy Cost Scenario			
United States	2.9	5.8	4.4
World	5.0	5.9	4.9

Source: Arthur D. Little, Inc., estimates.

world capital investment in each major product area. These estimates are shown in Table 8. The average worldwide factor is 6.1 of annual investment per dollar of annual sales. We have used this average as typical of the chemical industry worldwide and have estimated investment requirements by country, as shown in Table 9. Special ratios were developed for the United States to reflect its greater dependence on the petrochemical industry (see Appendix E).

To determine where chemical and petrochemical investment might actually take place around the world, we have expanded on the concept of our table defining "Multiplier Factors for New Investment" (Appendix B) as developed in our 1966 report. The updating of that table requires the addition of several new categories and a significant change in the weightings compared with our earlier evaluation. Of particular concern is the increasingly restrictive attitude of some governments toward the chemical industry as reflected in environmental regulations and delays in permitting new plant sites. We believe those factors currently controlling regional plant site decisions can be divided among government, industry, and financial factors. Table 10 shows our 1981 evaluation of the Multiplier Factors for New Investment.

A brief definition of each of the factors considered will help in assessing the meaning of the rating system:

Industry Factors

- *Market Size* is favorable when local demand is large enough to justify a world scale plant.
- *Market Growth* is a key to the ability of a region to absorb new plant capacity. A high growth rate is favorable.
- *Competitive Environment* is favorable when competition is weak. A large number of competitors with strong marketing capability yields a low score.
- *Supply/Demand Balance* is indicative of likely future operating rates. Long-term overcapacity is unfavorable.
- *Availability of Raw Materials and Energy*. With security of supply a key issue, only an indigenous supply of hydrocarbons and other raw materials yields a high favorable rating.

TABLE 8

ESTIMATED REQUIRED ANNUAL WORLD INVESTMENT
IN CHEMICAL PLANT AND EQUIPMENT BY
PRODUCT SECTOR, 1985-1995

(billions of 1978 dollars)

	¢/$ Sales	1985	1990	1995
Organic Chemicals	9.4	13	17	22
Plastic Materials	7.4	6	8	10
Man-Made Fibers	9.6	3	4	5
Synthetic Rubber	3.7	sm	sm	sm
Agricultural Chemicals	6.6	4	4	5
Drugs	4.2	4	6	8
Soap, Detergents, and Toilet Goods	2.1	1	2	2
Paint	2.3	1	1	1
Inorganic Chemicals	6.9	3	4	5
Miscellaneous	4.1	5	7	9
Total	6.1	40	53	67

sm = less than 0.5

Source: Arthur D. Little, Inc., estimates.

TABLE 9

REQUIRED ANNUAL WORLD INVESTMENT IN
CHEMICAL PLANT AND EQUIPMENT BY REGION, 1985–1995
(billions of 1978 dollars)

Region	1985	1990	1995
United States	9.6	12.9	16.5
Canada	0.7	0.9	1.2
Mexico	0.4	0.6	0.7
North America	10.7	14.4	18.4
Brazil	0.7	1.1	1.5
All Other South America	0.9	1.2	1.7
South America[1]	1.6	2.3	3.2
EEC	9.2	11.7	14.2
Other Western Europe	2.4	3.3	4.2
Western Europe	11.6	15.0	18.4
Saudi Arabia	0.2	0.3	0.4
Other Middle East	0.4	0.6	0.8
North Africa	0.1	0.1	0.2
Other Africa	1.0	1.4	1.9
Middle East and Africa	1.7	2.4	3.3
Japan	4.9	6.5	8.4
China (PRC)	0.6	0.9	1.2
Southeast Asia and Korea[2]	0.9	1.3	1.8
India and Other Asia	0.2	0.2	0.4
Australia and New Zealand	0.6	0.8	1.0
Asia and Pacific	7.2	9.7	12.8
USSR	4.4	5.9	7.5
Other Eastern Europe	2.3	2.9	3.7
Eastern Europe	6.7	8.8	11.2
TOTAL	39.5	52.6	67.3

Note: Based on 6.1¢ investment in plant and equipment per dollar of sales.

1. Also includes Central America.
2. Also includes Taiwan.

Source: Arthur D. Little, Inc., estimates.

TABLE 10

COUNTRY/REGIONAL MULTIPLIER FACTORS FOR NEW INVESTMENT IN COMMODITY CHEMICALS

Factor Weight	Investment Factors	United States	Canada	Mexico	Brazil	Other Latin America	Western Europe		Middle East		North Africa	Africa Other	Japan	China (PRC)	Southeast Asia and Korea	India/ Other Asia	Australia/ New Zealand	USSR	Other Eastern Europe
							EEC	Other	Saudi Arabia	Other									
	Industry Related																		
5	Market Size	+5	5	0	0	-5	+5	0	-5	-5	5	-5	+5	0	0	0	5	+5	+5
5	Market Growth	-5	5	+5	+5	+5	-5	0	0	+5	+5	+5	-5	+5	+5	0	0	0	0
5	Competitive Environment	-5	5	+5	+5	+5	-5	0	-5	+5	+5	+5	-5	+5	0	+5	0	+5	+5
5	Supply/Demand Balance	0	-5	+5	+5	+5	-5	0	-5	0	5	+5	0	+5	0	+5	-5	+5	+5
5	Available Raw Materials and Energy	+5	+5	+5	-5	0	0	-5	+5	+5	-5	+5	-5	+5	+5	-5	+5	+5	0
10	Cost of Raw Materials and Energy	0	+10	+10	-10	-10	-5	-10	+10	+5	-10	-5	-10	0	-5	-10	+5	0	0
5	Other Manufacturing Costs	+5	0	-5	0	-5	0	-5	-5	-5	-5	-5	0	-5	-5	-5	0	-5	-5
5	Infrastructure	+5	0	-5	0	-5	+5	0	-5	-5	0	-5	+5	+5	-5	-5	0	-5	0
5	Freight Advantage	+5	5	-5	0	-5	+5	0	-5	-5	0	-5	+5	+5	0	-5	-5	+5	+5
5	Export Know-How	0	0	-5	0	-5	+5	0	-5	-5	0	-5	+5	-5	0	-5	-5	-5	-5
65	Subtotal	+15	-10	+10	0	-20	0	-20	20	-5	-15	-10	-5	+10	-5	-30	-10	+10	+10
	Government Related																		
5	Attitude Toward Industry	-5	0	0	0	0	-5	0	+5	+5	+5	+5	0	+5	+5	0	0	0	+5
5	Incentives	-5	+5	+5	+5	+5	0	+5	+5	+5	+5	+5	-5	0	+5	0	0	0	0
5	Environmental Constraints	-5	0	+5	+5	+5	-5	0	+5	+5	+5	+5	-5	+5	-5	+5	-5	+5	+5
5	Tariff Protection	-5	+5	+5	+5	+5	0	+5	+5	+5	+5	+5	0	+5	+5	+5	+5	+5	+5
10	Political Stability	+10	+5	-5	-5	-10	+5	0	-5	-10	-5	-10	+10	0	-10	-10	+10	+10	-5
5	Economic Stability	+5	+5	0	-5	-5	+5	0	+5	-5	-5	-5	+5	0	-5	-5	+5	-5	-5
35	Subtotal	-5	+20	+10	+5	0	0	+10	+20	+5	+10	+5	+5	+15	+5	-5	+15	+15	+5
	Financial																		
10	Capital Cost and Capital Availability	+10	+10	-5	-5	-10	+10	+5	+10	0	-5	-10	+5	-10	0	-10	+10	-10	-10
10	Subtotal	+10	+10	-5	-5	-10	+10	+5	+10	0	-5	-10	+5	-10	0	-10	+10	-10	-10
100	Grand Total	+20	+20	+15	0	-30	+10	-5	+10	0	+10	-15	+5	+15	0	-45	+15	+15	+5
	Multiplier Factor	1.20	1.20	1.15	1.00	0.70	1.10	0.95	1.10	1.00	1.10	0.85	1.05	1.15	1.00	0.55	1.15	1.15	1.05

Note: Investment multipliers are an attempt to measure the likelihood that chemical plant investment in a particular location will be above or below that required to satisfy local market growth.

1. Also includes Taiwan.

Source: Arthur D. Little, Inc. estimates.

— *Cost of Raw Materials and Energy* is a key factor. The prospects for low-cost feedstock and raw materials yields a favorable score.

— *Relative Manufacturing Cost* must be low for a favorable rating. This includes all costs except hydrocarbon feedstocks, energy, and capital costs; each of these are rated separately.

— *Infrastructure* is required to support a new petrochemical plant. Many developing areas score low on this item.

— *Freight Advantage* belongs to those countries with a large local market. If product must be shipped a long way to market, the score for that region will be low.

— *Export Know-How* is required to compete in world markets; this holds back many countries trying to break into the chemical industry with an export plant.

Government Factors

— *Attitude Toward Industry* is a new dimension, which evaluates the degree of encouragement and cooperation extended by government to facilitate investment in a new petrochemical plant.

— *Incentives* are offered to new industry locating in many areas of the world. The lack of incentive programs would result in a low score on this point.

— *Environmental Constraints* have killed many proposed plants in the United States, which scores low on this issue. Europe and Japan are rapidly imposing constraints. Sooner or later all regions should score the same, thus eliminating this point as a factor. However, this is not the current situation.

— *Tariff Protection* provided by the local government can make a marginal plant profitable.

— *Political Stability* is in some ways the most important variable. This factor is actually an assessment of the probability that the local ground rules covering depreciation, taxes, repatriation of earnings, etc., will stay the same at least until the plant is paid out.

— *Economic Stability* is desirable as long as it does not mean long periods of zero economic growth.

Financial

— *Capital Cost and Availability* is a critical factor outside the developed countries and will be the key factor in determining the rate of petrochemical investment in the Third World as well as in the centrally planned economies.

The summation of the ratings in this analysis leads to a score that ranges from -45 to +20, as shown in Table 10. This score has been translated into a multiplier factor by assuming a zero score equals a multiplier of 1.0. In turn, a +20 rating is equated with a 1.2 multiplier while the -45 score is established as a 0.55 factor.

The evaluation presented in Table 10 suggests a continued trend toward investment in excess of consumption in the developed countries. In addition to the United States, EEC, and Japan, we expect Canada, Mexico, and Australia may well move into a period of high investment compared with domestic demand. It should be noted here that countries such as Mexico are substantial net importers today and it will require many years of investing beyond domestic demand growth to place Mexico in the ranks of the net exporters of chemicals. At the same time, continued high investment in Europe will only increase the overcapacity problem and put pressure on industry profits during periods of reduced economic activity.

If the United States implements a protectionist policy on energy and feedstock supplies so that a high-cost energy environment develops, the U.S. investment multiplier for chemicals would then be shifted downward. This reflects the fact that the United States would not be as desirable a location for new petrochemical investment under those conditions. In this environment, the United States would again be losing petrochemical investment to Europe and Japan as well as to Mexico,

Canada, and Australia/New Zealand. In each of these areas, investments will be made in excess of domestic demand growth, creating a long-term potential for increased exports.

The multiplier factors can be applied to the earlier estimates of required investment to establish the "likely" level of annual world investment in chemical plant and equipment by region (Table 11). Using the factors noted in Appendix E and the different levels of petrochemical demand under the Base Case, and the U.S. High-Cost Energy Scenario, estimates have been developed for "likely" U.S. and world chemical and petrochemical investment. These investment totals are shown in Table 12. As noted in Table 11, the likely level of investment will exceed the investment required to match consumption growth by about 10%. Obviously, some limited amount of capacity in excess of consumption growth is acceptable to maintain operating rate flexibility in the face of wide savings in production resulting from fluctuations in the economy. If there is to be substantial spare capacity built worldwide, then the critical question is whether the loss of investment in the United States under the U.S. High-Cost Energy Scenario will be made up by even larger investments abroad. We do not think that will happen.

In our analysis the key difference between the investment in the Base Case and the U.S. High-Cost Energy Scenario is that the multiplier factor for new investment in the United States has been reduced from 1.2 to 1.1. This change reflects the belief that should energy costs in the United States escalate higher than those in the world market due to some type of government intervention, then the United States becomes a less attractive place to invest compared with other parts of the world. However, a key difference in our assumptions about the future compared with our earlier analysis is that in an environment that already anticipates significant capacity growth worldwide we do not expect investment lost to the United States to be offset by investments in other parts of the world. Thus, multiplier factors and investment spending in other parts of the world remain the same in both the Base Case and the U.S. High-Cost Energy Scenario.

F. CHEMICAL AND PETROCHEMICAL TRADE IMPACT

The assessment of the changes in the petrochemical and chemical industry trade balances associated with the two scenarios being evaluated does not require a world trade forecast. This is because the

TABLE 11

LIKELY ANNUAL WORLD INVESTMENT IN
CHEMICAL PLANT AND EQUIPMENT BY REGION, 1985–1995
(billions of 1978 dollars)

Region	Investment Multiplier	1985	1990	1995
United States	1.2	11.5	15.5	19.8
Canada	1.2	0.8	1.1	1.4
Mexico	1.15	0.5	0.7	0.8
North America		12.8	17.3	22.0
Brazil	1.0	0.7	1.1	1.5
All Other South America	0.7	0.6	0.8	1.2
South America[1]		1.3	1.9	2.7
EEC	1.1	10.1	12.9	15.6
Other Western Europe	0.95	2.3	3.1	4.0
Western Europe		12.4	16.0	19.6
Saudi Arabia	1.1	0.2	0.3	0.4
Other Middle East	1.0	0.4	0.6	0.8
North Africa	0.95	0.1	0.1	0.2
Other Africa	0.85	0.8	1.2	1.6
Middle East and Africa		1.5	2.2	3.0
Japan	1.05	5.2	6.8	8.8
China (PRC)	1.15	0.7	1.0	1.4
Southeast Asia and Korea[2]	1.0	0.9	1.3	1.8
India and Other Asia	0.55	0.1	0.1	0.2
Australia and New Zealand	1.15	0.7	0.9	1.2
Asia and Pacific		7.6	10.1	13.4
USSR	1.15	5.1	6.8	8.6
Other Eastern Europe	1.05	2.4	3.1	3.9
Eastern Europe		7.5	9.9	12.5
TOTAL		43.1	57.4	73.2
Required Investment		39.5	52.6	67.3
Ratio of Likely Investment to Required Investment		1.09	1.09	1.09

1. Also includes Central America
2. Also includes Taiwan.

Source: Arthur D. Little, Inc., estimates.

TABLE 12

REQUIRED AND LIKELY INVESTMENT UNDER ALTERNATE SCENARIOS
(billions of 1978 dollars)

	Base Case			U.S. High Cost Energy Scenario		
	1985	1990	1995	1985	1990	1995
Required Investment						
Petrochemicals						
United States*	6.1	9.1	12.5	5.4	8.0	10.7
Rest of World	17.0	22.0	27.2	17.0	22.0	27.2
World Total	23.1	31.1	39.7	22.4	30.0	37.9
Other Chemicals						
United States*	3.8	4.5	5.3	3.7	4.4	5.1
Rest of World	12.6	17.0	22.3	12.6	17.0	22.3
World Total	16.4	21.5	27.6	16.3	21.4	27.4
All Chemicals						
United States*	9.9	13.6	17.8	9.1	12.4	15.8
Rest of World	29.6	39.0	49.5	29.6	39.0	49.5
World Total	39.5	52.6	67.3	38.7	51.4	65.3
Likely Investment**						
Petrochemicals						
United States	7.3	10.9	15.0	5.9	8.8	11.8
Rest of World	17.9	23.2	28.5	17.9	23.2	28.5
World Total	25.2	34.1	43.5	23.8	32.0	40.3
Other Chemicals						
United States	4.6	5.4	6.4	4.1	4.8	5.6
Rest of World	13.3	17.9	23.3	13.3	17.9	23.2
World Total	17.9	23.3	29.7	17.4	22.7	28.8
All Chemicals						
United States	11.9	16.3	21.4	10.0	13.6	17.4
Rest of World	31.2	41.1	51.8	31.2	41.1	51.8
World Total	43.1	57.4	73.2	41.2	54.7	69.2

*Adjusted U.S. Petrochemical and Other Chemical Investment data based on U.S. petrochemical growth, as shown in Appendix E.

**U.S. Required Investment x 1.2 for base case; x 1.1 for U.S. High Cost Energy Scenario; World Regional Investment x 1.09 equals Likely Investment. All chemicals for Rest of World by difference. See Appendix E.

Source: Arthur D. Little, Inc., estimates.

reduced U.S. sales resulting from lost investment in the United States can all be assumed to be lost export sales or increased imports to the United States. These differences are shown in Table 13 and are related to lost export dollar volume (or increased imports) through a sales-to-investment ratio of $1 of incremental sales per dollar of chemical investment. For petrochemicals, the ratio used was 90 cents of additional sales per dollar of incremental investment. The result is a change of nearly $4 billion in the U.S. petrochemical trade balance by 1995.

While it is not essential to forecast trade to establish the difference in trade volume between the two scenarios, it is helpful to review the expectations for future trade volume in order to test the reasonableness of the difference forecast. In Table 14 we have forecast petrochemical trade at the same growth rate as U.S. consumption to establish the approximate size of the trade balance in 1985, 1990, and 1995 for the Base Case. The loss in trade balance compared with this forecast is in the range of 15-20%, which appears reasonable considering the magnitude of the cost changes. By summing the differences in consumption and trade, it is also possible to estimate the loss in U.S. petrochemical production. In 1995 the loss in petrochemical output has grown to nearly $33 billion (1980 dollars).

G. RESULTS

The comparison of the Base Case with the U.S. High-Cost Energy Scenario has focused on identifying the differences in U.S. petrochemical demand, investment, and international trade. In 1995 these differences in 1980 dollars are summarized as follows:

- U.S. domestic demand for petrochemicals would be reduced as much as 15%; this is equivalent to about $28 billion per year.
- Petrochemical investment in the United States would likely be curtailed by 20%; this is equal to a loss of nearly $4 billion of investment; and
- The U.S. balance of trade in petrochemicals would decrease by 20% with a loss of about $4 billion.

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TABLE 13

IMPACT OF ANNUAL INVESTMENT DIFFERENCES ON U.S. EXPORTS
(billions of 1978 dollars)

	1985	1990	1995
U.S. Chemical Investment			
Base Case	11.9	16.3	21.4
High Cost Energy Scenario	10.0	13.6	17.4
Difference	1.9	2.7	4.0
U.S. Petrochemical Investment			
Base Case	7.3	10.9	15.0
High Cost Energy Scenario	5.9	8.8	11.8
Difference	1.4	2.1	3.2
Export Impact			
Assume investment differences reflected in reduced export capacity			
U.S. Petrochemicals Trade Balance Change @ 90¢ additional sales/$ invested	1.3	1.9	2.9
U.S. Other Chemical Trade Balance Changes @ $1.00 additional sales/$ invested	0.5	0.6	0.8
Estimated Total Chemical Trade Balance Change	1.8	2.5	3.7

TABLE 14

U.S. PETROCHEMICAL PRODUCTION AND TRADE FORECAST 1978-1995
(billions of 1978 dollars)

	1978	1985	1990	1995
• **Base Case**				
Consumption	54.2	72.9	107.6	148.6
Exports[1]	+ 8.0	+10.8	+ 15.9	+ 21.9
Imports[1]	+ 2.9	− 3.9	− 5.8	− 8.0
Trade Balance	5.1	6.9	10.1	13.9
U.S. Production	59.3	79.8	117.7	162.5
• **U.S. High-Cost Energy Scenario**				
Consumption		64.3	95.4	127.1
Base Case Trade Balance		6.9	10.1	13.9
Lost Export Sales		1.1	1.9	2.9
Adjusted Trade Balance		5.8	8.2	11.0
U.S. Production		70.1	103.6	138.1
Loss in Petrochemical Production		9.7	14.1	24.4
• **Summary of Annual Results in 1980 Dollars**				
— Petrochemical Consumption[2] (See Above)				
Base Case		95.5	140.9	194.5
U.S. High Cost Energy Scenario		84.1	124.9	166.4
Dollar Difference		11.4	16.0	28.1
Percent Change		11.9%	11.4%	14.4%
— Petrochemical Investment[3] (see Table 13)				
Base Case		8.6	12.9	17.7
U.S. High Cost Energy Scenario		7.0	10.4	14.0
Dollar Difference		1.6	2.5	3.7
Percent Change		18.6%	19.4%	20.9%
— Petrochemical Trade Balance[2] (See Above)				
Base Case		9.0	13.2	18.2
U.S. High Cost Energy Scenario		7.6	10.7	14.4
Dollar Difference		1.4	2.5	3.8
Percent Change		15.6%	18.9%	20.9%
— Loss in Petrochemical Production[3] (See Above)				
Dollar Difference		12.7	18.5	31.9
Percent Change		12.2%	12.0%	15.0%

1. Forecast at the same growth rate as U.S. consumption.
2. Price deflator for chemicals 1980/1978 = 1.309.
3. Price deflator for GNP 1980/1978 = 1.183.

Source: Arthur D. Little, Inc., estimates.

CHAPTER V

THE EFFECT OF HIGH-COST ENERGY AND FEEDSTOCK SUPPLIES ON PETROCHEMICAL-DEPENDENT INDUSTRIES IN THE UNITED STATES

In its report for The Petrochemical Energy Group on "The Petrochemical Industry and the U.S. Economy," Arthur D. Little identified those sectors of the U.S. economy that are dependent on the U.S. petrochemical industry. In this earlier study it was determined that those products directly dependent on petrochemical output in the United States:

- comprised nearly 23% of all business sales;
- required just over 16% of capital investment;
- paid over 18% of total business tax revenues, and
- involved about 19% of total nongovernment-related employment.

Those sectors of the economy dependent on petrochemicals have grown some 20-25% faster than the economy as a whole. A shift to the U.S. High-Cost Energy Scenario will affect these industries because their raw material cost position will be increased. Their options are either to import foreign petrochemicals or pass on the higher costs to the consumer. In the latter case, the finished consumer product also becomes more vulnerable to import competition.

Because the United States is a complex and dynamic economy, it is difficult to clearly trace the full primary and secondary impact of a change in any given economic parameter. However, the major change in energy costs that occurred in 1974 provides an event with such a significant impact that we believe it is possible to draw conclusions about the sensitivity of various sectors of the economy to energy price change by comparing the performance of these sectors both before and after this event. Thus, to establish the impact of high energy costs on petrochemical-dependent industries, an analysis was made of how these industries responded to the major shift in energy values experienced over the past decade. It was assumed that during a rapid shift in energy

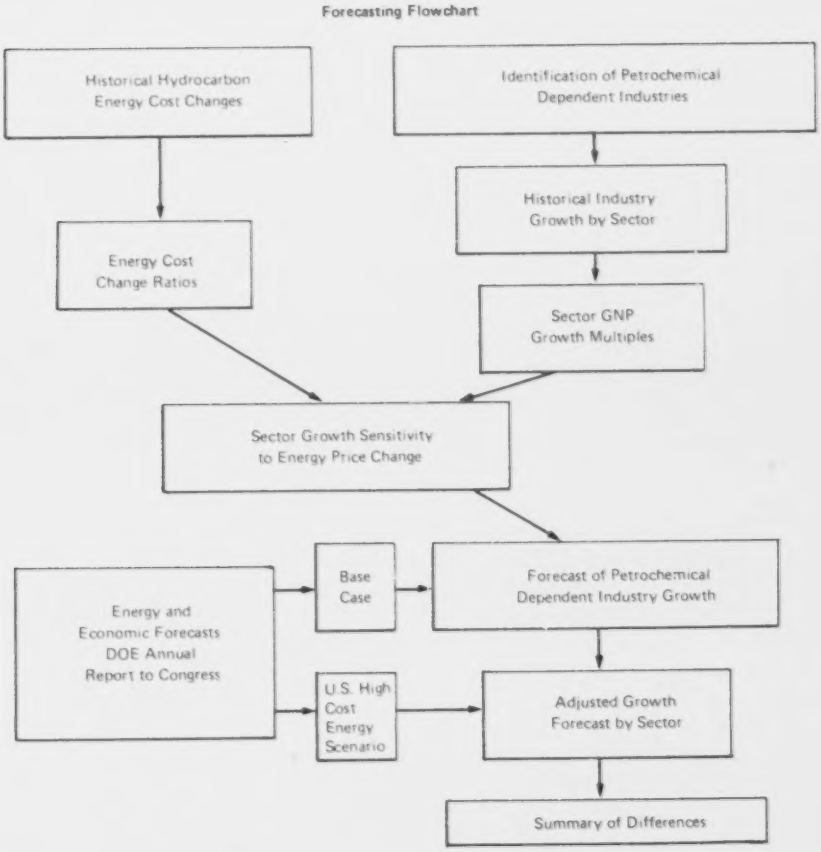
values in the future, there would be a comparable change in industry growth and development. The flowsheet for this analysis is shown in Figure 8.

Specifically, we have compared the rate of real growth in value of shipments for the petrochemical and petrochemical-dependent industries with GNP growth for two key time periods. The first period included 1967-1973 when energy prices were stable. The second time period was 1973-1977 when energy prices were escalating rapidly. GNP and energy cost changes during these two periods are shown in Table 15. Data on changes in industry growth rates compared to GNP are summarized in Table 16. Using the historic industry growth between these two time periods compared to GNP growth, we have established two GNP multiplier factors for each industry. These multiplier factors have then been plotted against the historic energy price change multipliers for the same time period. This graphic display of the rate of change in industry — GNP growth compared with energy price changes — gives a clear indication of the sensitivity of various sectors of the economy to the rapid changes in energy values that shook the world economy during 1973-1974. Detailed industry statistics are shown in both tabular and graphic form in Appendix F.

The results of the analysis are summarized in Figure 9 and suggest a significantly different growth rate for the petrochemical industry during the periods of stable energy prices than for petrochemical dependent industries. The higher growth in petrochemical consumption compared with the dependent industries is the result of substitution of conventional materials by synthetics during periods of stable energy pricing. Substitution growth slows dramatically during periods of rapid change in energy and feedstock prices for two reasons. First, the price of synthetics rises rapidly in relation to conventional materials causing those users who are considering a switch to synthetics to postpone the decision. Second, rapid energy price increases have typically created general economic slowdowns, which reduce the willingness of companies to make the necessary capital commitment required to purchase the new equipment to process synthetics.

Using the Department of Energy Forecasts for energy price increases (Table 17) and economic growth we have developed estimates of the approximate difference in growth that may be experienced in the petrochemical and petrochemical-dependent industries under both the

Figure 8. Impact of U.S. High-Cost Energy Scenario on Petrochemical Dependent Industries in the United States


Forecasting Flowchart
Historical Hydrocarbon Energy Cost Changes
Identification of Petrochemical Dependent Industries
Historical Industry Growth by Sector
Energy Cost Change Ratios
Sector GNP Growth Multiples
Sector Growth Sensitivity to Energy Price Change
Energy and Economic Forecasts DOE Annual Report to Congress
Base Case
Forecast of Petrochemical Dependent Industry Growth
U.S. High Cost Energy Scenario
Adjusted Growth Forecast by Sector
Summary of Differences

Source: Arthur D. Little, Inc.

TABLE 15

HISTORIC ENERGY COST AND GNP MULTIPLIER FACTORS

	1967	1973	1977
I. Change in Average Cost of Hydrocarbon Fuels			
Quantity – Quad. BTUs			
Production	52.97	58.66	55.26
+ Imports	6.19	14.73	20.09
- Exports	2.15	2.07	2.10
= Consumption	57.01	71.32	73.25
Value – Billion Current Dollars			
Production	15.52	24.81	58.96
+ Imports	2.21	8.14	44.19
- Exports	1.09	1.72	4.18
= Consumption	16.64	31.23	98.97
Average Value of Consumption – ¢/MM BTU			
Current Dollars	29.19	43.72	135.11
Constant 1972 Dollars	36.94	41.39	95.35
Energy Cost Change Ratios:			
1967-1973		1.12	
1973-1977			2.30
II. Change in Real GNP			
Billions of Constant 1972 Dollars	1007	1235	1340
Growth Rate: 1967-1973 (%/yr)	–	3.45	–
1973-1977 (%/yr)	–	–	2.07

Source: U.S. Department of Energy – Annual Report to Congress – 1979, Volume Two, and Economic Report of the President, January 1980.

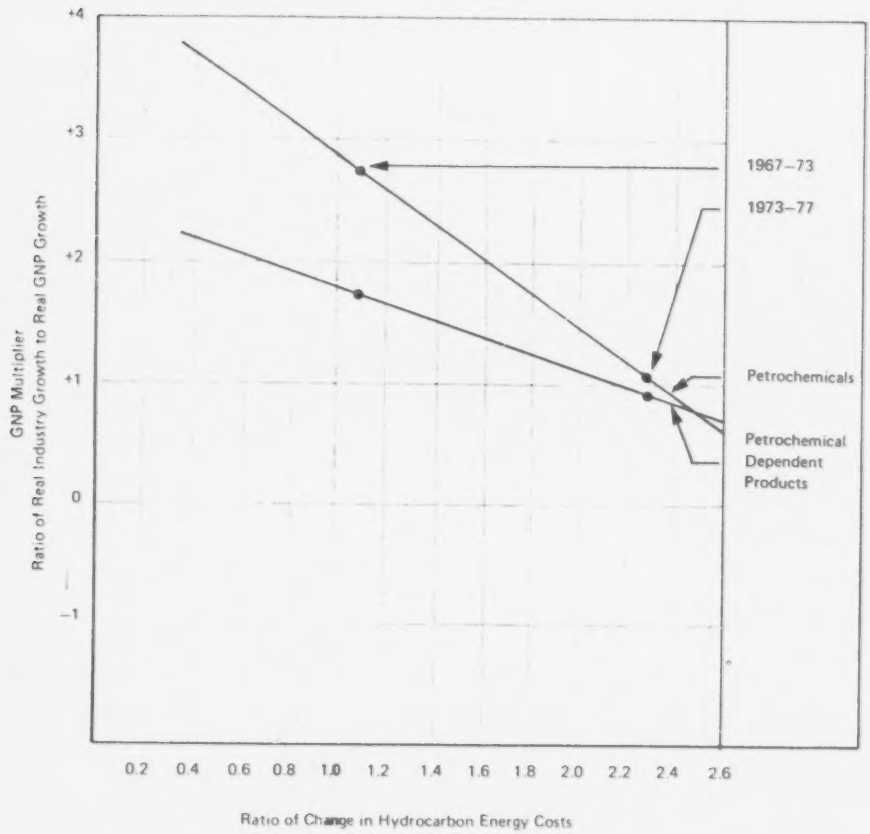
TABLE 16

HISTORIC GROWTH RATES FOR VALUE OF SHIPMENTS AND INDUSTRY GNP MULTIPLIER

	1967-1973		1973-1977	
	Growth Rate (%/year)	GNP Multiplier	Growth Rate (%/year)	GNP Multiplier
Petrochemicals	9.28	2.69	2.07	1.00
Petrochemical Dependent Products				
Other Chemical and Allied Products	4.96	1.44	2.68	1.30
Textiles and Apparel	3.17	0.92	1.83	0.88
Furniture	6.50	1.88	(-0.48)	(-0.23)
Rubber and Plastic Products	8.54	2.48	2.66	1.28
Leather Products	(-1.44)	(-0.42)	(-1.46)	(-0.71)
Coated Paper	3.03	0.88	(-0.73)	(-0.35)
Electrical Appliances	4.18	1.21	2.54	1.23
Building Materials	5.98	1.73	(-1.18)	(-0.57)
Toys, Jewelry and Notions	5.43	1.57	2.25	1.09
Photo Equipment and Supplies	8.37	2.43	4.94	2.39
Motor Vehicles	7.57	2.19	2.95	1.42
Boats, Motor Homes and Recreational Vehicles	16.15	4.68	(-3.67)	(-1.77)
All Petrochemical Dependent Products	5.64	1.63	1.98	0.96
National GNP	3.45	1.63	2.07	0.96

Source: U.S. Department of Commerce, Census of Manufactures; see Appendix F.

Figure 9. Impact of Changing Energy Costs on Petrochemicals and Petrochemical Dependent Products



Source: U.S. Census of Manufactures; U.S. Department of Energy

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TABLE 17

FORECAST GROWTH IN ENERGY COST AND GNP MULTIPLIER FACTORS

(constant 1979 dollars)

	Base Case	U.S. High Cost Energy Scenario
I. Forecast Change in Average Cost of Crude Oil – (dollars/barrel)		
1977 – U.S. Imported Oil	16.71	16.71
1985 – World Oil Price	32.00	39.00
– 1977-85 Multiplier	1.92	2.33
1990 – World Oil Price	37.00	44.00
– 1985-90 Multiplier	1.16	1.13
1995 – World Oil Price	41.00	56.00
– 1990-95 Multiplier	1.11	1.27
II. Forecast Change in Real GNP – (billions of dollars)		
1977	2218	2218
1985 – Forecast GNP	2718	2696
– 1977-85 Growth Rate (%/yr)	2.57	2.47
1990 – Forecast GNP	3159	3116
– 1985-90 Growth Rate (%/yr)	3.05	2.95
1995 – Forecast GNP	3569	3501
– 1990-95 Growth Rate (%/yr)	2.47	2.36

Source: U.S. Department of Energy – Annual Report to Congress – 1979, Volume Three

Base Case and U.S. High-Cost Energy Scenario as noted in Table 18. These future growth rates were derived from the forecast of a GNP multiplier by industry determined by the plotted lines in Figure 9 and Appendix F. As an example, the following steps were used to estimate the 1977-1985 growth rate of petrochemicals under the Base Case:

- Take the forecast change in average cost of crude oil for 1977-1985 (Table 17) of 1.92.
- Enter Figure 9 at 1.92 on the horizontal axis.
- Read out the GNP multiplier for petrochemicals of 1.55 on the vertical axis.
- Take the forecast GNP growth (Table 17) of 2.57 and multiply by 1.55.
- The result is the forecast growth of 3.98 for petrochemicals in Table 18.

Translating each of the energy and GNP growth estimates into forecasts of industry value of shipments provides a measure of the differrential impact of higher energy and feedstock costs on both the petrochemical and petrochemical-dependent industries. Appendix G details these forecasts by sector. The results are summarized in Table 19.

The dollar difference between the Base Case and the U.S. High-Cost Energy Scenario in 1995 (in 1980 dollars) suggests a direct loss to the economy of $28 billion in petrochemical shipments and $81 billion in the output of petrochemical-dependent industries. This loss is equivalent to a decline of nearly 15% in petrochemical sales and 8% in the shipments of those sectors of the economy dependent on petrochemicals.

TABLE 18

ESTIMATED INDUSTRY GROWTH RATES[1]

	197701985		1985-1990		1990-1995	
	Base Case	US High Cost Energy Scenario	Base Case	US High Cost Energy Scenario	Base Case	US High Cost Energy Scenario
Petrochemicals	3.98	2.35	8.08	8.24	6.67	5.90
Petrochemical Dependent Products						
Other Chemicals & Allied Products	3.60	3.33	4.58	4.41	3.71	3.42
Textiles & Apparel	229	2.17	2.81	2.68	2.27	2.15
Furniture	1.03	(-.74)	5.49	5.44	4.57	3.89
Rubber & Plastic Products	4.37	3.21	7.47	7.35	6.18	5.55
Leather Products	(-1.67)	(-1.73)	(-1.53)	(-1.32)	(01.11)	(-1.18)
Coated Paper	0.13	(.99)	2.44	2.50	2.10	1.65
Electrical Appliances	3.21	3.09	3.81	3.68	3.09	2.95
Building Materials	.77	(1.48)	6.10	6.03	5.06	4.25
Toys, Jewelry & Notions	3.09	2.59	4.58	4.56	3.83	3.54
Photographic Equipment	6.17	5.80	7.47	7.20	6.05	5.78
Motor Vehicles	4.24	3.46	6.56	6.47	5.43	4.96
Boats, Motor Homes & Recreational Vehicles	0.77	(-2.22)	13.42	13.23	11.12	9.20
National GNP	2.57	2.47	3.05	2.94	2.47	2.36

1. Based on Historic Rates of Change in Industry/GNP growth compared to Energy Price Changes and Government Forecasts of GNP and Crude Oil Price Increases.

Sources: U.S. Department of Energy – Annual Report to Congress – 1979, Volume Three, and Arthur D. Little, Inc., estimates.

TABLE 19

FORECAST DIFFERENCE IN VALUE OF SHIPMENTS TO 1995*

(billions of 1980 dollars)

	1995 Difference Between Base Case and U.S. High-Cost Energy Scenario	
	Dollars	Percent Change
Petrochemicals	28.1	14.4
Petrochemical Dependent Products		
Other Chemical & Allied Products	4.4	4.1
Textiles and Apparel	3.6	2.1
Furniture	2.0	16.1
Rubber and Plastic Products	14.4	11.7
Leather Products	sm	0.8
Coated Paper	0.5	10.3
Electrical Appliances and Equipment	2.3	2.3
Building Materials	11.7	20.0
Toys, Jewelry and Notions	1.1	5.1
Photographic Equipment	2.2	5.1
Motor Vehicles	30.4	8.4
Boats, Motor Homes, and Recreational Vehicles	8.0	28.6
Subtotal	80.6	7.8
Total	108.7	8.8

*Based on Historic Rates of Change in Industry/GNP Growth compared to Energy Price Changes and Government Forecasts of GNP and Crude Oil Price Increases.

Source: U.S. Department of Energy – Annual Report to Congress – 1979 Volume Three and Arthur D. Little, Inc., estimates; see Appendix G.

APPENDICES

A-1 Annual Chemical Industry Investment in Western Europe, Japan, and the United States

A-2 Sales Value of Chemical Industry Production in Western Europe, Japan, and the United States

A-3 Chemical Industry Investment Analysis Dollars of Annual Investment/Dollar of Annual Sales in Western Europe, Japan, and the United States

B Multiplier Factors for New Investment

C Petrochemical Industry Expenditures for New Plant and Equipment in the United States

D-1 Balance of Trade in Chemicals

D-2 U.S. Balance of Trade in Petrochemicals

E Determination of Investment Factors and Estimates of Required and Likely Annual U.S. and World Petrochemical and Chemical Investment

F-1 Growth in Value of Shipments and GNP Multipliers

F-2 Impact of Changing Energy Costs on Industry Growth Rates — Building Materials, Furniture, and Coated Paper

F-3 Impact of Changing Energy Costs on Industry Growth Rates — Boats, Motor Homes and Recreational Vehicles, Rubber and Plastic Products, Motor Vehicles, Toys, Jewelry and Notions, and Leather Products

F-4 Impact of Changing Energy Costs on Industry Growth Rates — Photographic Equipment, Other Chemical and Allied Products, Electrical Appliances, and Textiles and Apparel

G Estimated Impact of Higher Energy Costs on the Output of Petrochemical and Petrochemical Manufacturing Industries

APPENDIX A-1

ANNUAL CHEMICAL INDUSTRY INVESTMENT IN WESTERN EUROPE, JAPAN, AND THE UNITED STATES*

(millions of dollars)

Year	Western Europe**	Japan	United States	Total	% U.S.	Ratio W.E./U.S.
1958	1,330	190	1,320	2,840	38	1.01
1959	1,470	260	1,230	2,960	42	1.20
1960	1,760	405	1,600	3,765	42	1.10
1961	2,120	545	1,620	4,285	38	1.31
1962	2,175	465	1,560	4,200	37	1.39
1963	2,310	515	1,610	4,435	36	1.43
1964	2,600	705	1,970	5,275	37	1.32
1965	2,990	655	2,590	6,235	42	1.15
1966	3,540	515	2,990	7,045	42	1.18
1967	3,260	825	2,880	6,965	41	1.13
1968	3,030	1,330	2,840	7,200	39	1.07
1969	3,380	1,605	3,100	8,085	38	1.09
1970*	5,070	2,030	3,400	10,500	32	1.49
1971	5,430	1,805	3,535	10,770	33	1.54
1972	4,370	1,515	3,450	9,335	37	1.27
1973	5,600	1,815	4,460	12,075	37	1.30
1974	6,820	2,870	5,690	15,380	37	1.20
1975	7,230	2,960	6,250	16,440	38	1.16
1976	7,490	3,110	7,120	17,720	40	1.05
1977	7,605	3,350	7,585	18,540	41	1.00
1978	8,200	3,815	7,995	20,030	40	1.03

*The OECD definition of the Chemical Industry excluded synthetic fibers and synthetic rubber through 1969. Synthetic fibers were included starting in 1970.

**1958-1967 estimates based on investments of eight major producing countries representing 95% of industry investment annually.

Source: "The Chemical Industry" published annually by the Organization for Economic Cooperation and Development.

APPENDIX A-2

SALES VALUE OF CHEMICAL INDUSTRY PRODUCTION
IN WESTERN EUROPE, JAPAN AND THE UNITED STATES*

(billions of dollars)

Year	Western Europe	Japan	United States	Total	% U.S.
1958	15.8	2.1	23.2	41.1	56
1959	17.1	2.6	26.3	46.0	57
1960	20.3	3.1	26.6	50.0	53
1961	21.6	3.5	27.3	52.4	52
1962	23.0	4.0	29.3	56.3	52
1963	24.4	4.5	31.8	60.7	52
1964	27.2	4.7	34.3	66.2	52
1965	29.8	5.5	37.5	72.8	52
1966	32.7	6.9	40.8	80.4	51
1967	35.6	8.4	42.4	86.4	49
1968	37.6	9.7	46.6	93.9	50
1969	40.0	11.4	48.8	100.2	49
1970*	43.0	12.9	49.3	105.2	47
1971	52.6	16.5	51.9	121.0	43
1972	61.7	19.5	58.2	139.4	42
1973	81.8	27.3	65.0	174.1	37
1974	113.2	35.1	81.4	229.7	35
1975	115.4	34.2	86.4	236.0	37
1976	123.8	38.2	101.4	263.4	38
1977	130.9	46.2	118.0	295.1	40
1978	161.0	62.1	126.5	349.6	36

*The OECD definition of the Chemical Industry excluded synthetic fibers and synthetic rubber through 1969. Synthetic fibers were included starting in 1970. Sales data includes exports.

Source: "The Chemical Industry" published annually by the Organization for Economic Cooperation and Development.

APPENDIX A-3

CHEMICAL INDUSTRY INVESTMENT ANALYSIS
DOLLARS OF ANNUAL INVESTMENT/DOLLARS OF ANNUAL SALES
WESTERN EUROPE, JAPAN, AND THE UNITED STATES

(cents)

Year	Western Europe	Japan	United States
1958	8.4	9.0	5.7
1959	8.6	10.2	4.7
1960	8.7	13.1	6.0
1961	9.8	15.5	5.9
1962	9.5	11.7	5.3
1963	9.5	11.5	5.1
1964	9.6	14.9	5.7
1965	10.0	11.9	6.9
1966	10.8	7.5	7.3
1967	9.2	9.9	6.8
1968	8.1	13.7	6.1
1969	8.5	14.0	6.4
1970	11.8	15.7	6.9
1971	10.3	10.9	6.8
1972	7.1	7.8	5.9
1973	7.1	6.6	6.9
1974	6.0	8.2	7.0
1975	6.3	8.7	7.2
1976	6.1	8.1	6.7
1977	5.8	7.3	6.4
1978	6.3	5.0	5.7

Source: "The Chemical Industry" published annually by the Organization for Economic Cooperation and Development.

APPENDIX B

MULTIPLIER FACTORS FOR NEW INVESTMENT

	U.S.	Canada and Australia	EEC	EFTA	Japan	Asia	LAFTA	CAFTA and Mexico	Africa
Economics of Scale	+20	- 5	+15	+ 5	+ 5	-20	-15	-15	-20
Rel. Mfg. Costs (100% quota) [0-10% quota]	+ 5 [0]	- 5	+ 5	0	+ 5	0	+ 5	+ 5	- 5
Tariff Protection	-10	- 5	-10	0	5	+10	+10	+10	+ 5
Extent of Competition	-20	-15	-20	-15	-25	+ 5	+ 5	0	+ 5
Government Incentives	-10	-10	-10	- 5	+ 5	+ 5	+ 5	0	0
Freight Protection	0	+ 5	0	0	+ 5	+ 5	+ 5	+ 5	+ 5
Political Stability	+10	+10	+10	+10	+ 5	-10	-10	0	-10
Economic Stability	+10	+10	+10	+ 5	+ 5	-10	-10	+ 5	- 5
Exporting Know-how	0	+ 5	+10	+ 5	+ 5	-20	-20	-20	-20
	+ 5 [0]	-10	+10	+ 5	+15	-35	-25	-10	-45
Multiplier Factor	1.05 [1.00]	.90	1.10	1.05	1.15	.65	.75	.90	.55

Source: Arthur D. Little, Inc., report to The Dow Chemical Company and Monsanto Company entitled "Oil Import Quotas and the U.S. Balance of Payments in Petrochemicals," March 1966, page 30.

APPENDIX C

PETROCHEMICAL INDUSTRY EXPENDITURES FOR NEW PLANT AND EQUIPMENT IN THE UNITED STATES

(millions of dollars)

	Cyclic Intermediates (2816,2865)	Organic Chemicals (2818, 28609)	Plastics (2821)	Synthetic Rubber (2822)	Synthetic Fibers (2824)	Surface Active Agents (2843)	Carbon Black (2895)	Medicinals (2833)	Nitrogen Fertilizers[1] (2873)	Total Investment		
										Current Dollars	Plant Cost Factor[2]	Constant Dollars[3]
1960	98.9	297.7	155.0	48.2	48.1	1.9	10.3	25.4	–	685.5	102.0	672.1
1961	69.6	380.6	157.3	59.5	117.6	12.3	10.2	15.1	–	822.2	101.5	810.1
1962	80.3	267.9	149.5	41.9	118.4	10.5	9.6	17.9	–	696.0	102.0	682.3
1963	106.8	401.0	137.8	32.3	170.3	7.2	4.0	14.0	–	873.4	102.4	852.9
1964	103.5	496.4	209.5	23.3	163.6	5.8	8.0	8.8	–	1018.9	103.3	986.4
1965	91.9	641.2	219.8	35.1	363.0	7.2	10.1	9.2	–	1377.6	104.2	1322.0
1966	88.4	886.2	300.0	41.9	384.7	9.1	13.3	17.2	–	1740.8	107.2	1623.9
1967	136.1	781.2	310.1	75.2	309.7	8.0	23.4	36.2	–	1679.9	109.7	1531.4
1968	99.3	884.8	270.3	78.1	244.7	9.1	27.0	31.6	–	1644.9	113.6	1448.0
1969	140.4	711.7	295.9	79.8	246.4	8.3	15.8	23.7	–	1522.0	119.0	1279.0
1970	289.2	716.6	307.4	49.3	310.3	14.0	11.9	48.5	–	1747.2	125.7	1390.0
1971	279.6	659.4	315.0	49.0	351.6	19.8	17.8	82.5	–	1774.7	132.2	1342.4
1972	158.8	661.7	253.2	35.5	372.5	19.7	11.8	51.5	33.4	1598.1	137.2	1164.8
1973	200.8	789.6	330.7	46.1	422.8	25.1	14.2	28.2	104.4	1961.9	144.1	1361.5
1974	319.9	1259.5	587.8	57.2	574.5	31.6	16.6	70.7	114.9	3032.7	165.4	1833.6
1975	432.0	1675.2	637.8	30.9	700.9	34.7	30.5	110.3	400.0	4052.3	182.4	2221.7
1976	443.6	2208.8	746.4	46.4	534.2	35.6	19.5	130.3	604.7	4769.5	192.1	2482.8
1977	443.1	2882.6	895.2	53.2	338.5	41.1	22.7	123.8	734.4	5534.6	204.1	2711.7
1978	446.3	2346.5	972.4	48.1	487.5	109.1	27.7	127.2	300.6	4865.4	218.8	2223.7

1. Not reported until 1972
2. Chemical Engineering Plant Cost Index 1967-69 = 100
3. Current dollars ÷ Plant Cost Factor = constant construction cost dollars

Source: Annual Survey of Manufactures, U.S. Department of Commerce

APPENDIX D-1

BALANCE OF TRADE IN CHEMICALS
(SITC 5)

(millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Western Europe*												
Exports	10,230	11,870	13,400	15,130	18,510	26,210	41,460	38,280	43,820	50,005	62,510	86,540
Imports	7,880	9,450	10,790	12,060	14,590	20,575	31,820	29,155	34,600	38,925	48,070	68,470
Balance	2,350	2,420	2,610	3,070	3,920	5,635	9,640	9,125	9,220	11,080	14,440	18,070
Japan												
Exports	810	1,020	1,230	1,490	1,780	2,150	4,070	3,885	3,720	4,300	5,085	6,100
Imports	580	690	810	1,810	910	1,665	2,270	1,750	2,260	2,460	3,030	5,180
Balance	230	330	420	- 320	870	485	1,800	2,135	1,460	1,840	2,035	920
United States												
Exports	3,290	3,380	3,830	3,840	4,130	5,750	8,820	8,705	9,960	10,825	12,720	17,310
Imports	1,040	1,140	1,230	1,380	1,830	2,330	4,125	3,550	4,495	5,355	6,330	7,490
Balance	2,250	2,240	2,600	2,460	2,300	3,420	4,695	5,155	5,465	5,470	6,390	9,820
Latin America												
Exports	295	370	420	455	570	910	1,450	1,440	1,640	2,120	2,025	
Imports	1,660	1,750	2,020	2,210	2,610	3,370	6,260	5,595	5,690	6,295	7,260	
Balance	-1,365	-1,380	-1,600	-1,755	-2,040	-2,460	-4,810	-4,155	-4,050	-4,175	-5,235	
Centrally Planned Economies												
Exports	1,310	1,440	1,550	1,720	2,200	2,740	3,855	4,420	4,440	5,035	5,705	
Imports	1,770	1,900	2,050	2,260	2,850	3,585	5,430	6,365	6,080	7,035	8,320	
Balance	- 460	- 460	- 500	- 540	- 650	- 845	-1,575	-1,945	-1,820	-2,000	-2,615	
Rest of World												
Exports	1,035	1,220	1,460	1,635	1,985	2,610	4,405	4,225	4,930	5,605	6,030	
Imports	4,040	4,370	4,980	4,550	6,386	8,845	14,155	14,540	15,405	17,820	21,045	
Balance	-3,005	-3,150	-3,530	-2,915	-4,400	-6,235	-9,750	-10,315	-10,475	-12,215	-15,015	

Notes: *EEC & EFTA combined

Source: United Nations Monthly Bulletin of Statistics. For earlier years see the following Arthur D. Little, Inc., reports: Trade Trends in Petrochemicals – 1968/1969/1970/1973/1976

APPENDIX D-2

U.S. BALANCE OF TRADE IN PETROCHEMICALS[1]
(millions of dollars)

Year	Exports		Imports		Trade Balance	
	Current Dollars	Constant[2] Dollars	Current Dollars	Constant[2] Dollars	Current Dollars	Constant[2] Dollars
1965	1589	1605	287	290	1302	1315
1966	1691	1701	372	374	1319	1327
1967	1743	1743	374	374	1369	1369
1968	2049	2053	511	512	1538	1541
1969	1984	1986	573	574	1411	1412
1970	2282	2233	756	740	1526	1493
1971	2242	2154	996	957	1246	1197
1972	2362	2267	1084	1040	1278	1227
1973	3396	3059	1187	1069	2209	1990
1974	5396	3676	1912	1303	3484	2373
1975	4647	2556	1644	904	3003	1652
1976	5807	3102	1907	1019	3900	2083
1977	6279	3257	2366	1227	3913	2030
1978	8007	4028	2908	1463	5099	2565

1. For detailed development of U.S. petrochemical trade, see the following Arthur D. Little reports: Trade Trends in Petrochemicals 1968/69/70/73/76/78.

2. Chemical and Allied Products, Producer Price Index Deflator 1967 = 100.

Source: U.S. Department of Commerce, Bureau of the Census, Economic Report of the President, January 1981, and Arthur D. Little, Inc., estimates.

APPENDIX E

DETERMINATION OF INVESTMENT FACTORS AND ESTIMATES OF REQUIRED AND LIKELY ANNUAL U.S. AND WORLD PETROCHEMICAL AND CHEMICAL INVESTMENT

- Required Petrochemical Investment Worldwide

	¢/$ Sales	1978	1985	1990	1995
Organic Chemicals	9.4	8.9	12.6	16.9	21.6
Plastics	7.4	3.3	5.3	7.8	10.4
Fibers	9.6	2.4	3.2	3.8	4.5
Rubber	3.7	0.3	0.3	0.3	0.4
All Other Petrochemicals	6.1	1.2	1.7	2.3	2.8
Total		16.1	23.1	31.1	39.7
World Industry Total		27.5	39.5	52.6	67.3
Percent of Investment for Petrochemicals		59	58	59	60

- Petrochemical Investment Forecast

Petrochemical Consumption Base Case	192	275	371	473
Investment Factor ¢/$ Sales	8.3	8.4	8.4	8.4
Base Case				
U.S. Consumption	54.2	72.9	107.6	148.6
Required U.S. Investment	4.5	6.1	9.1	12.5
Rest of World (by difference)	11.6	17.0	22.0	27.2
U.S. High Cost Energy Scenario				
U.S. Consumption		64.3	95.4	127.1
Required U.S. Investment		5.4	8.0	10.7
World Investment (Rest of World Constant)		22.4	30.0	37.9

- Forecast of Investment in Chemicals

All Other Consumption Base Case	258	370	489	627
Investment (total less petrochemicals)	11.4	16.4	21.5	27.6
Investment Factor ¢/$ Sales	4.4	4.4	4.4	4.4
Base Case				
U.S. Consumption Non-petrochemicals	66	85	103	121
Required U.S. Investment (Non-petrochemicals)	2.9	3.8	4.5	5.3
Plus Required Petrochemical Investment	4.5	6.1	9.1	12.5
Total U.S. Chemical Investment	7.4	9.9	13.6	17.8
Rest of World Total Chemical (by difference)	20.1	29.6	39.0	49.5

APPENDIX E (Continued)

	1985	1990	1995
U.S. High Cost Energy Scenario			
U.S. Consumption Non-petrochemicals	83	100	115
Required U.S. Investment (Non-petrochemicals)	3.7	4.4	5.1
Plus Required Petrochemical Investment	5.4	8.0	10.7
	9.1	12.4	15.8
World Chemical Investment (Rest of World Constant)	38.7	51.4	65.3
• Investment Difference for Likely Investment			
U.S. Petrochemicals			
Base Case (Required x 1.2)	7.3	10.9	15.0
U.S. High Cost Energy Scenario (Required x 1.1)	5.9	8.8	11.8
Difference	1.4	2.1	3.2
U.S. Chemicals			
Base Case (Required x 1.2)	11.9	16.3	21.4
U.S. High Cost Energy Scenario (Required x 1.1)	10.0	13.6	17.4
Difference	1.9	2.7	4.0
• Rest of World Investment for Base Case			
Required Investment Worldwide	39.5	52.6	67.3
Less: US Total Chemical Investment Required	9.9	13.6	17.8
Rest of World Required Chemical Investment	29.6	39.0	49.5
Likely Investment Worldwide (1.09X)	43.1	57.4	73.2
Less US Total Likely Chemical Investment	11.9	16.3	21.4
Rest of World Likely Chemical Investment	31.2	41.1	51.8
Derived Investment Factor for Rest of World	1.054	1.054	1.046
Other Chemical Required Investment	12.6	17.0	22.3
Other Chemical Likely Investment	13.3	17.9	23.3
Required Petrochemical Investment	17.0	22.0	27.2
Likely Petrochemical Investment	17.9	23.2	28.5

Source: Arthur D. Little, Inc., estimates

APPENDIX F-1

GROWTH IN VALUE OF SHIPMENTS AND GNP MULTIPLIERS
(millions of constant 1972 dollars)

		Note	1967	1973 Old SIC	1973 New SIC	1977	1967-1973 Growth Rate (%/year)	1967-1973 GNP Multiplier (3.45)	1973-1977 Growth Rate (%/year)	1973-1977 GNP Multiplier (2.07)
Petrochemicals										
2821	Plastic Resins	1	3,081.4	6,310.1	4,961.0	4,984.6				
2822	Synthetic Rubber		936.4		1,159.5	1,134.1				
2824	Synthetic Fibers		1,992.3		4,653.5	5,421.3				
2833	Medicinals		459.2		647.1	1,442.9				
2843	Surface Active Agents		315.2		479.4	771.5				
2865	Cyclic Intermediates		1,616.2		2,358.0	2,342.3				
2869	Organics		6,454.5		10,365.3	10,507.8				
2873	Nitrogen	2	900.0		916.3	1,164.6				
2895	Carbon Black		170.0		237.6	209.8				
	Total		15,929.2	27,126.8	25,777.7	27,978.9	9.28	2.69	2.07	1.00
Petrochemical Dependent Products										
Other Chemicals and Allied Products										
2834	Pharmaceuticals		4,836.8		7,620.4	8,864.0				
2841	Soaps and Detergents		2,815.4		3,706.8	3,670.9				
2844	Toilet Preparations		2,820.9		4,362.9	5,126.0				
2851	Paint		3,434.8		4,120.0	4,315.3				
2974	Phosphates	2	1,218.0		1,292.9	1,630.3				
2875	Fertilizers		750.0		896.5	1,092.7				
2879	Agricultural Chemicals	1	914.2	1,221.3	1,307.6	1,285.3				
2891	Adhesives	1	558.8	882.8	1,099.6	1,136.8				
2892	Explosives		745.3		412.9	380.7				
2893	Printing Ink		443.7		523.8	491.2				
2899	Chemical Preparations nec	1	1,630.7	1,918.2	2,045.2	2,453.0				
	Total		20,168.6	26,958.5	27,388.6	30,446.2	4.96	1.44	2.68	1.30
Textiles and Apparel										
22	Textiles		22,509.4		28,078.2	30,550.0				
23	Apparel		24,482.8		28,595.2	30,391.8				
	Total		46,992.2		56,673.4	60,941.8	3.17	0.92	1.83	0.88

APPENDIX F-1 (Continued)

		Note	1967	1973 Old SIC	1973 New SIC	1977	1967-1973 Growth Rate (%/year)	1967-1973 GNP Multiplier (3.45)	1973-1977 Growth Rate (%/year)	1973-1977 GNP Multiplier (2.07)
Furniture										
2512	Upholstered Furniture	1	1,474.1	2,269.2	2,175.5	2 161.3				
2515	Mattresses		825.0		1,159.0	1,092.5				
2519	Household Furniture		64.9		180.3	214.3				
2531	Public Building Furniture		469.0		524.5	494.4				
	Total		2,833.0	4,133.0	4,039.3	3,962.5	6.50	1.88	(-0.48)	(-0.23)
Rubber and Plastic Products			13,945.1	22,806.8	23,620.0	25,329.3	8.54	2.48	2.66	1.28
Leather Products										
314	Footwear		3,675.3		3,197.1	2,771.2				
316	Luggage		362.7		396.6	422.9				
317	Women's Handbags		558.2		620.0	778.9				
	Total		4,596.2		4,213.7	3,973.0	(-1.44)	(-0.42)	(-1.46)	(-0.71)
Coated Paper										
2641	Paper Coatings		1,780.1		2,129.2	2,068.1	3.03	0.88	(-0.73)	(-0.35)
Electrical Appliances and Equipment										
363	Appliances		5,732.7		7,686.2	8,017.0				
365	Radio & TV		3,875.9		5,754.0	7,052.0				
366	Communication Equipment		12,306.3		14,349.4	15,459.1				
3691	Storage Batteries		653.1		1,060.2	1,369.9				
	Total		22,568.0		28,851.8	31,898.0	4.18	1.21	2.54	1.23
Building Materials										
2491	Wood Preserving		496.4		448.1	547.0				
2492	Particleboard		51.5		316.9	318.9				
3357	Nonferrous Wiring		4,176.6		5,014.7	4,914.2				
3429	Hardware		2,846.5		3,463.3	3 490.0				
3585	Refrigeration & Heating Equipment	1	4,171.5	7,601.6	8,089.2	7,314.7				
3993	Signs		1,002.8		1,195.1	1,041.2				
3996	Hard Surface Flooring		232.0		349.1	375.8				
	Total		12,977.3	18,388.8	18,876.4	18,001.8	5.98	1.73	(-1.18)	(-0.57)

APPENDIX F-1 (Continued)

		Note	1967	1973 Old SIC	1973 New SIC	1977	1967-1973 Growth Rate (%/year)	1967-1973 GNP Multiplier (3.45)	1973-1977 Growth Rate (%/year)	1973-1977 GNP Multiplier (2.07)
Toys, Jewelry and Notions										
394	Toys		2,526.0		3,659.0	3,969.7				
395	Pens and Pencils		754.4		1,024.1	1,178.6				
396	Jewelry		1,014.1		1,215.2	1,300.0				
	Total		4,294.5		5,898.3	6,448.3	5.43	1.57	2.25	1.09
Photographic Equipment and Supplies										
3861	Photographic Equipment		3,910.6		6,333.7	7,681.1	8.37	2.43	4.94	2.39
Motor Vehicles										
3711	Motor Vehicles		31,363.9		49,829.1	57,250.4				
3713	Trucks and Buses		854.9		1,570.7	2,272.4				
3714	Motor Vehicles & Parts		14,646.2		21,079.5	22,021.9				
3751	Motorcycles		361.5		696.6	640.7				
	Total		47,226.5		73,175.9	82,185.4	7.57	2.19	2.95	1.42
Boats, Motor Homes and Recreation Vehicles										
3732	Boats		649.2		1,069.2	1,217.3				
3792	Trailers		1,562.8		1,174.5	1,274.6				
2451	Motor Homes				3,188.1	2,185.0				
	Total		2,212.0		5,431.8	4,676.9	16.15	4.68	(-3.67)	(-1.77)
All Petrochemical Dependent Products			183,503.6	254,944.9	256,632.1	277,612.4	5.64	1.63	1.98	0.96

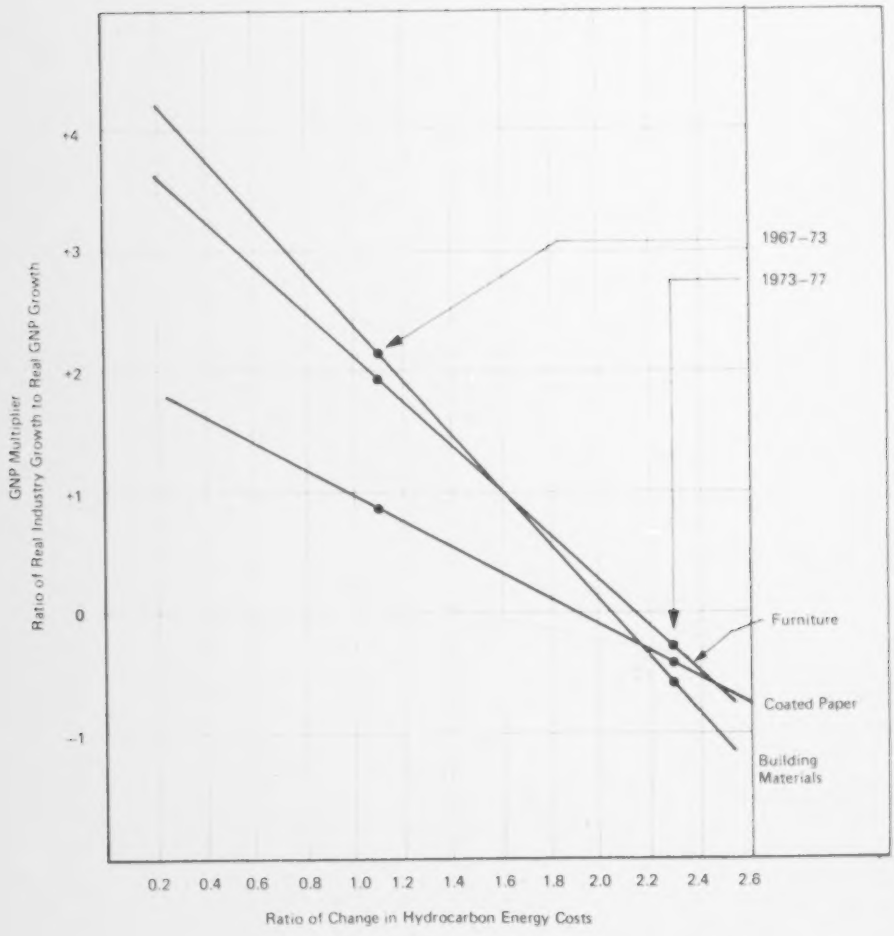
APPENDIX F-1 (Continued)

		Note	1967	1973 Old SIC	1973 New SIC	1977	1967-1973 Growth Rate (%/year)	1967-1973 GNP Multiplier (3.45)	1973-1977 Growth Rate (%/year)	1973-1977 GNP Multiplier (2.07)
All Chemical and Allied Products										
	Petrochemicals		15,929.2	27,126.8	25,777.7	27,978.9	9.28	2.69	2.07	1.00
	Petrochemical Dependent Chemical and Allied Products		20,168.6	29,958.5	27,388.6	30,446.2	4.96	1.44	2.68	1.30
	Non-petrochemical Dependent Chemical and Allied Products									
2812	Alkalies and Chlorine		727.6		841.9	768.6				
2813	Industrial Gases		595.8		775.5	915.6				
2716	Inorganic Pigments		555.9		836.7	623.0				
2819	Industrial Inorganic Chemicals	1	3,513.4	5,263.5	4,074.9	4,764.5				
2823	Cellulosic Man-Made Fibers		958.8		627.0	735.0				
2831	Biological Products		169.0		383.5	612.6				
2842	Polishes & Sanitation Goods	1	1,213.3	1,574.2	1,914.4	1,957.0				
2861	Gum & Wood Chemicals		218.5		344.4	353.1				
			7,952.5	10,646.7	9,798.3	10,729.4	4.98	1.44	2.30	1.11
	All Chemical and Allied Products except Petrochemicals		28,118.9	37,605.2	37,186.9	41,175.6	4.96	1.44	2.58	1.25
Grand Total All Chemicals and Allied Products			44,048.1	64,732.0	62,964.6	69,154.5	6.63	1.92	2.37	1.15

Note 1 Change in industry composition requires using old industry definition in 1973 to determine growth rates.
Note 2 New industry in 1972 required estimated split of 1967 between new industries.

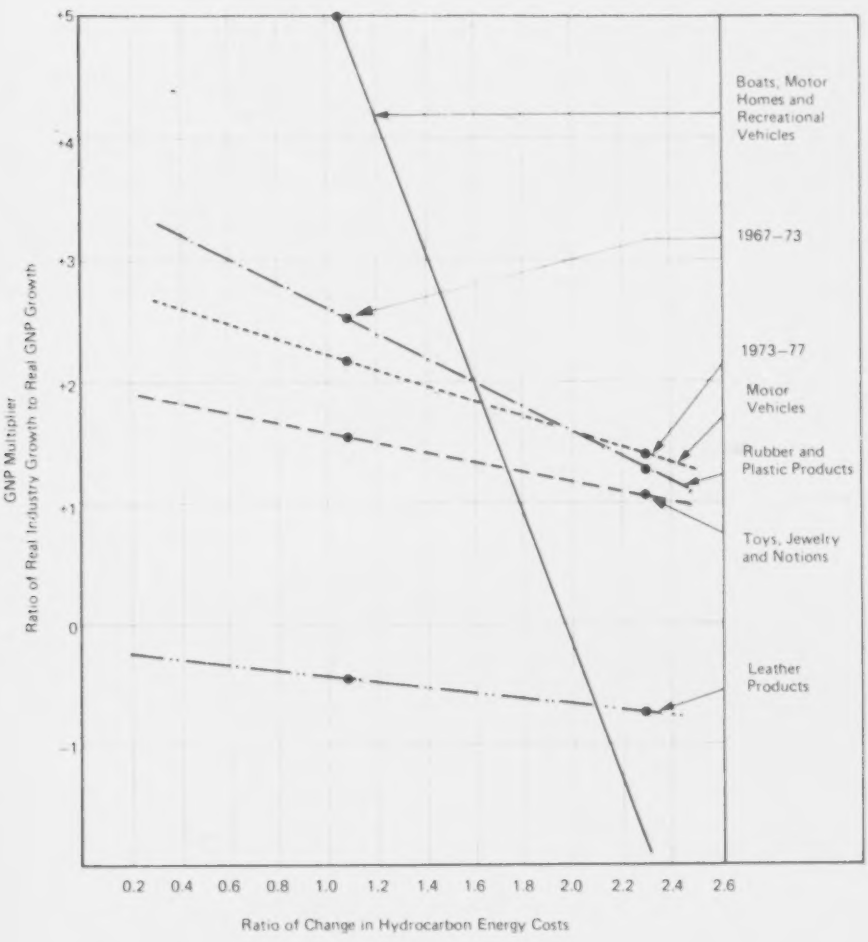
Source: Department of Commerce, Census of Manufactures and Arthur D. Little, Inc., estimates.

Appendix F—2. Impact of Changing Energy Costs on Industry Growth Rates



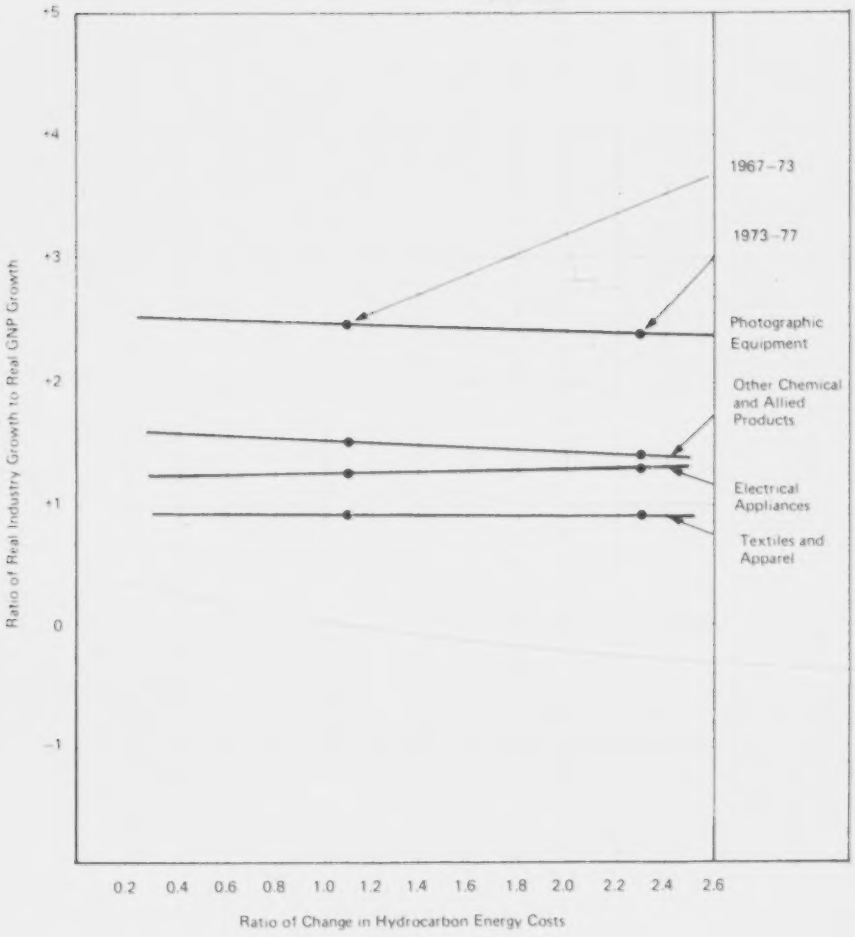
Source: U.S. Census of Manufactures; U.S. Department of Energy

Appendix F–3. Impact of Changing Energy Costs on Industry Growth Rates



Source: U.S. Census of Manufactures; U.S. Department of Energy

Appendix F—4. Impact of Changing Energy Costs on Industry Growth Rates



Source: U.S. Census of Manufactures, U.S. Department of Energy.

APPENDIX G

ESTIMATED IMPACT OF HIGHER ENERGY COSTS ON THE OUTPUT OF PETROCHEMICAL AND PETROCHEMICAL DEPENDENT MANUFACTURING INDUSTRIES
(millions of constant 1972 dollars)

	1985					1990					1995					1977-1985	
	Base Case		U.S. High Cost Energy Scenario			Base Case		U.S. High Cost Energy Scenario			Base Case		U.S. High Cost Energy Scenario				
Sector	GNP Ratio	Value of Shipments	GNP Ratio	Value of Shipments	Difference	GNP Ratio	Value of Shipments	GNP Ratio	Value of Shipments	Difference	GNP Ratio	Value of Shipments	GNP Ratio	Value of Shipments	Difference	Difference in 1980 dollars	Percent Change
Petrochemicals	1.55	38,242	0.95	33,682	4,559	2.65	56,406	2.70	50,032	6,374	2.70	77,896	2.50	66,639	11,257	28,110	14.4
Petrochemical Dependent Industries																	
Other Chemicals & Allied Products	1.40	40,397	1.35	39,582	815	1.50	50,522	1.50	49,114	1,408	1.50	60,501	1.45	58,113	2,388	4,416	4.1
Textiles & Apparel	0.89	73,043	0.68	72,361	682	0.92	87,896	0.91	82,591	1,308	0.92	93,864	0.91	91,859	2,005	3,568	2.1
Furniture	0.40	4,300	(-.30)	3,734	566	1.80	5,618	1.85	4,866	752	1.85	7,024	1.65	5,890	1,134	2,012	16.1
Rubber & Plastic Products	1.70	35,661	1.30	32,616	3,045	2.45	51,131	2.50	46,469	4,624	2.50	68,991	2.35	60,904	8,087	14,356	11.7
Leather Products	(-.65)	3,472	(-.70)	3,456	16	(-.50)	3,215	(-.45)	3,200	15	(-.45)	3,041	(-.50)	3,016	25	44	0.8
Coated Paper	0.05	2,089	(-.40)	1,910	179	0.80	2,351	0.85	2,161	196	0.85	2,615	0.70	2,346	269	477	10.3
Electrical Appliances & Equipment	1.25	41,079	1.25	40,683	396	1.25	49,530	1.25	48,728	802	1.25	57,663	1.25	56,353	1,310	2,328	2.3
Building Materials	0.30	19,143	(.60)	15,975	3,168	2.00	25,738	2.05	21,405	4,333	2.05	32,949	1.80	26,355	6,594	11,761	20.0
Toys, Jewelry & Notions	1.20	8,219	1.05	7,914	305	1.50	10,280	1.55	9,889	391	1.55	12,404	1.50	11,768	636	1,129	5.1
Photographic Equipment	2.40	12,389	2.35	12,053	336	2.45	17,777	2.45	17,080	697	2.45	23,848	2.45	22,623	1,225	2,174	5.1
Motor Vehicles	1.65	114,574	1.40	107,872	6,702	2.15	157,419	2.20	147,585	9,834	2.20	205,098	2.10	187,966	17,132	30,401	8.4
Boats, Motor Homes etc.	0.30	4,973	(-.90)	3,907	1,066	4.40	9,335	4.50	7,272	2,063	4.50	15,811	3.90	11,294	4,517	8,015	28.6
Total Petrochemical Dependent Industries		359,349		342,073	17,276		466,821		440,390	26,431		583,909		538,487	45,422	80,501	7.8
Expected GNP Growth	2.57		2.41			3.05		2.94			2.47		2.36				
1980 Dollar Equivalent																	
Petrochemicals		95,494		84,110			140,851		124,935			194,514		166,404		28,110	
Total Petrochemical Dependent Industries		837,865		607,009			828,374		781,472			1,036,147		955,646		80,501	

Note: 1980 price deflator in constant 1972 dollars = 1.7745 for Petrochemical Dependent Products
1980 price deflator for petrochemicals = 2.4971

Source: Arthur D. Little, Inc. estimates

Senator BENTSEN. Mr. Melaas, you have spoken eloquently on the problems of protectionism. I guess around here I'm known as one of the last of the free traders. In fact, during my reelection in 1982 an issue was made of the fact that I did not support domestic content.

Here are the problems: The trade figure of a $160 billion deficit is projected next year. The Oil Daily quoted Energy Secretary Harrington as saying, "The Government may eventually need to step in and protect domestic refiners." Business Week carried an editorial on April 8 saying, "Refiners should haul the illegal OPEC subsidies before the International Trade Commission and seek countervailing tariffs on imported gasoline." Mr. Melass, you heard the testimony of Texaco and you've heard of the severe problems in the Golden Triangle, and those are major problems right now.

How do you think we should deal with them? One of the problems, if you continue to export our manufacturing base, we will really have a serious problem in this country. We simply cannot be a nation without a diversified manufacturing base. You have to have that.

Mr. MELAAS. Senator, I do not come before you saying that we do not have a problem in the United States with the demise of the manufacturing industries throughout this country.

Senator BENTSEN. I'm asking for some solutions and some suggestions of help.

Mr. MELAAS. I support your efforts fully in the fact that you are initiating work, thought, study which will eventually and should lead to some solution of this problem.

My purpose in being here is to appraise you of the impact that some of these things which you may do or you are considering will have on another segment of the industry throughout the country, the petrochemical industry, because there can be a direct effect on our cost structure and we are all fighting to remain competitive right now.

Senator BENTSEN. I realize that or I would have moved a long time ago on this. I would have moved on an import fee. The only thing that's kept me from doing it thus far is concern about what happens upstream as far as competitiveness of petrochemicals and some of the others. We are trying to evaluate that and see where we're hurting the most.

Let me ask you, you have some of the same situation that Texaco has, as I understand it, with investments overseas and investments in this country, major investments in both places. You have invested in Saudi Arabia, haven't you?

Mr. MELAAS. Yes, we do. Celanese Chemical Co. does.

Senator BENTSEN. Now what about your feedstock there? Are you paying the same kind of price you would pay for feedstocks in this country or are you paying something less?

Mr. MELAAS. Let me make the situation over there as clear as I know how to make it. The investment we have in Saudi Arabia is a methanol unit. We have methanol units also in this country. The methanol unit there is a joint venture with the Saudi Government and another distribution company in Texas.

We have supplied the technical expertise for that operation and indeed the reason that we are over there is what I referred to in

my testimony of the fact that raw material prices are lower in that country.

Senator BENTSEN. How much lower?

Mr. MELAAS. I do not have the information available to me.

Senator BENTSEN. Would you supply for the record what your feedstock costs in this country and what it costs in Saudi Arabia?

Mr. MELAAS. I will try to do that, Senator, yes.

[The following information was subsequently supplied for the record:]

CELANESE
CHEMICAL COMPANY, INC.

April 29, 1985
BAM-090-85

Congress of the United States
Joint Economic Committee
Washington, DC 20510

Attention: Mr. George Tyler

Dear Mr. Tyler:

At the April 18, 1985 hearing held by the Subcommittee of the Joint Economic Committee on Economic Goals and Intergovernmental Policy, Senator Bentsen requested information on the cost of natural gas feedstock used in the Celanese joint venture methanol facility in Saudi Arabia. This memorandum is to provide that information.

The natural gas feedstock cost is determined by formula and is dependent upon the profitability of the overall venture. Initially, the feedstock cost is $0.50 per MM Btu. When a certain profitability is reached, the cost of the feedstock increases in proportion to that profitability.

I am hopeful that this information is helpful to the Committee.

Sincerely,

Bruce A. Melaas
Director, Safety, Health
and Environment

Mr. MELAAS. We look at our competition on a worldwide basis.

Senator BENTSEN. Mr. Tell, what about your feedstock costs overseas? Are they lower than they are in this country?

Mr. TELL. Well, if you're referring to crude oil, the official price is set by the producing governments and we've found that they hold to the line pretty firmly on that. There is a spot market in crude. It's a growing spot market. Sometimes it's a little lower, sometimes it's a little higher, but the deviation has not been that great—maybe 50 cents a barrel.

They certainly do not offer to sell to us at the crude costs that would seem to be implicit in the prices that they are willing to sell their own products for into the east coast.

Senator BENTSEN. Congresswoman Fiedler.

Representative FIEDLER. I was just interested if you would please tell me what your impression is of the potential impact on our export situation as well as our import situation of the tax plan in its potential impact.

Mr. TELL. I would be pleased to respond to that. In my prepared statement I indicated that I think the domestic refining industry at the present time is just right on the brink. There have been many plants closed. There have been many others who have been hanging on hoping that there would be improvement, and it wouldn't take too much more, I'm afraid, in a number of instances to push some more over the brink.

That could come through additional investments mandated in the environmental area. It could come through this very large new superfund tax that is currently before the Congress. And it certainly could come with the withdrawal of the very important capital formation incentives that are under the existing tax laws—the investment tax credit, the accelerated depreciation. And in addition—and I think this is very important to understand—we also have proposals in the original Treasury plan that would remove the current practice with respect to the expensing of the intangible drilling costs. Now that will have a devastating effect on the upstream segments of the industry and we have seen estimates that that could mean a drop in U.S. production in the early 1990's by as much as a million barrels a day. Those are additional energy sources that will have to be imported and you have the question, well, if we have to import, should it be crude or maybe we just use more of these subsidized products.

I think, again, that does not bode well for the future configuration of the domestic refining base in the United States, which is an industry that in my sense is not only important economically but it has other values, including national security, that need to be very, very carefully weighed.

Representative FIEDLER. One other question if I may. This morning in the newspaper, the majority leader on the House side Mr. Wright indicated that the Democrats are looking at a possible 15 percent corporate tax. Could you tell me what you think the impact of that might be on your industry?

Mr. TELL. Well, one of the things that is most troubling of course with respect to the tax reform proposals is, although they seem to be based on the concept of revenue neutrality, that seems to be in terms of total receipts to the Treasury and not as between business

taxpayers and individual taxpayers. Indeed, the Treasury proposal in the estimates that I've seen would increase the taxes paid by American business by something over $160 billion over the next 4 years.

Now we are today competing in a global economy. The United States is not an island. And with all of the other problems that our domestic industry is having in trying to be competitive internationally, to impose a crushing new tax burden is just a step in the opposite direction. A tax is like any other cost—overhead, payroll—if it's not recovered in price, then the firm isn't going to be able to continue in business.

Corporations and business firms are conduits by which tax costs are pushed down to consumers. That isn't, I'm afraid, as well appreciated as it should be. But the problems in the trade area that we have been discussing this morning would be greatly aggravated if the kind of proposals that were in the original Treasury recommendations are ultimately enacted into law. I hope that there would be some modification.

Mr. WEINSTEIN. If I could respond to your question, we have looked into the relationship between these tax proposals and its impact on the rig count. In the study that we prepared for the subcommittee there is a chart, figure 5, and it shows the domestic rig count between 1977 and 1984. The peak occurred in 1981 at about 4,000. The count dropped tremendously in 1983 when it was down to 2,250, and it has now recovered slightly to 2,500.

We estimate that if the percentage depletion allowance is removed and the current expensing of intangible drilling costs is removed that the rig count would probably fall to under 2,000—or 1,900 versus 2,500 today.

That would result in the loss of another 8,000 to 10,000 jobs in our region because one of the big industries in the gulf coast is the manufacturing of drilling rigs and other types of oil field equipment.

So I would argue that the impact on these proposals, both in terms of production and the manufacture of equipment, would be devastating.

Representative FIEDLER. I would just simply like to say—and I thank you both for the information—that I am very deeply concerned about the potential impact of these particular plans because I don't feel at this time that there's a full understanding of the scope of the implications of them. It's easy to take a simplistic view of tax simplification, flat tax, tax reform, which I think we all want, but it's another thing to understand the full outcome of the massive shifting of investment from one place to another and the massive new obligations which might be heaped upon an industry such as yours which is already facing some catastrophic problems as it is, and I would urge you strongly—those of you who are involved in the industry—to make certain that those people who are looking at those changes are well aware of what you believe the analysis is of its implication on your industry. I would like to receive some background information on it as well because those decisions are being looked at right now and, frankly, are something that Congress may begin to move on in the not too distant future and we ought to know that the outcome will be if we pass them.

Senator BENTSEN. I certainly think that is a comment which is well needed. I serve on the Finance Committee in the Senate and I want simplification too. But I notice that in the last tax bill we passed in 1984, we added 1,300 pages of simplification and we are to the point where I can barely make out my own tax return. I should hire a so-called expert to do it.

The Golden Triangle has its problems because it has such a dependency on the oil and gas industry. Judge Thomas, with your interest in the area and understanding of the area, what do you see being done from the public or from the corporate standpoint in the way of retraining of employees, finding other jobs, diversification? What is being done in our area along those lines?

Judge THOMAS. Senator, let me address the first part of your question first, and that is the point of what is the community doing, the people doing. I can assure you that there is a very realistic appraisal of the circumstances that exists in our area associated with this industry. We know we are in trouble. The leaders know that the area is in trouble and there is a very, very aggressive movement by all the community leaders of the Golden Triangle to diversify the area as quickly as possible and we probably have a cooperative spirit that exists now that has never existed there in my lifetime.

I am very optimistic that because of that, that energy and that attitude, that we are going to be able to diversify our industrial base and we will be able to offset what we anticipate will necessarily occur, which is these refineries are going to have to come to the Government and ask for some relief. There's going to have to be some tax adjustment for them. They have been paying a substantial amount of taxes in our area over these many, many years of so-called good years, and now that we see it in a different posture, I look for a total different approach, and that is one of cooperation, adjustment, and helping them live and survive in our area.

What we don't want is for any of our plants to close, and anything that we can do to permit them to remain in our area we're going to do that.

To the extent that industry is engaged in a retraining program, I'm not sure that I can address that as effectively probably as Mr. Sheppard. I'm not aware to what extent that is an avenue that's being pursued with perhaps the vigor that it should be and, second, we are not seeing that reflected in the employment picture. Emmett may have a better handle on that specific information that might be of some benefit to you.

Senator BENTSEN. Judge, what we have seen so far of government programs to aid retraining is not encouraging. When you've got a fellow who is 40 years old and all of a sudden he's out of a job without reemployment prospects in his industry because it's having some problems, the Government is not effectively able in many cases to get him where he is productive again. What the Government has done has not been very effective. We keep searching for something that will work.

Mr. Sheppard, do you have any comments on that?

Mr. SHEPPARD. Senator, I think we have been very fortunate in our area. In the layoff at Texaco, the employees, many of them, took the incentive retirement. I think the younger employees were

offered something like $5,000 worth of retraining money if they go back to college or get training in something. Some of them are taking advantage of this.

Locally down there we've got HRDI, which is a program with the AFL-CIO and PEC combined, working together down there to retrain and place them in jobs. And the JPD, a program working through the governor's office, we've got three—one in Orange, one in Beaumont and one in Port Arthur—and they use our hall down there and I know they've got a classroom.

A lot of these people went to work at Texaco back in 1960 and have got 15 or 20 years there. They thought they had a job there for life and when they went to work that's the way it was. Their daddy worked there and their granddaddy worked there and they just assumed they were going to be there for life, so they filled out an application and went to work. Well, they're training them down there at least to show them what their skills are because all they've ever done is work at Texaco. But they've picked up many skills there, how to fill out a résumé, how to go about finding a job. Surprisingly enough, we're getting about 64 percent replacement down in that area. Now we're having to move a lot of them outside the area. I've talked to the Governor about it. If we don't get some jobs down there, we're going to need lots of relocation money down there because we're moving a lot of them out. There's a lot of nickle and dime jobs, a lot of jobs like blacksmith. We've got the race track right across the street over in Louisiana and they have quarter horses and we've got a lot of them being bred and raised down in our area but didn't have any blacksmith, so we had to send them to Oklahoma to school to teach them how to be a blacksmith. Of course you can't have an overabundance of blacksmiths, but we have got two or three or four of them that we trained in that.

We're sending some of them to lineman school, you know, they're climbing poles and working with Liberty Cable TV companies and stuff like this, some of them having to go to Dallas and take a cut in wages.

But the replacement has been about 64 percent so far and I think that's real good and it's kept the attitude of the employee that was laid off a little more positive because I think he thought he was just going to lose his job and nobody would care about him and it's been a real good program down there. I think that's worked real effectively.

Senator BENTSEN. I get the feeling that you think Texaco has been pretty cooperative in the problem?

Mr. SHEPPARD. Yes, they sure have.

Senator BENTSEN. I suppose you wouldn't argue with that, Mr. Tell?

Mr. TELL. Well, I had hoped that that would be the assessment. We certainly have in our severance programs tried to build in retraining components and, as the other witnesses have indicated, I think that they have worked as well as you could anticipate and hope for in the circumstances.

Senator BENTSEN. The OPEC producers are capturing market share by pricing below market costs. The immediate reaction is, this gives us a lower gasoline price. This is great for the consumer.

But if this predatory pricing puts the refineries out of business in our country, if it makes us really dependent again on OPEC to the extent we were, what happens? They are not in it for charitable purposes and they are the same crowd who stuck it to us pretty good in the seventies by running up prices with the cartel. That's no free market. They ran those prices up to what they thought the market would bear. They overreached. Then we passed all kinds of laws mandating conservation in automobiles and that type of thing.

Is there anything to make you think that they wouldn't, if they got control of the situation again, raise prices for gasoline for consumers in our country?

Mr. TELL. Well, I think, Senator, that there is a track record that's pretty clear on that point and I think it's anomalous that under our own U.S. antitrust laws we have prohibitions against predatory pricing below cost sales in order to achieve dominant market position because experience has shown that once that market dominance is created after the competitors have been forced out of business the prices go up very, very significantly.

Certainly when the cartel in the 1970's was able to establish that kind of market control, as you indicated, the prices went up several fold in a short period of time and the economic shocks I think we're just starting to understand what that really did to the economy of the United States and the horrible inflation experience and the dislocation, and it's incredible to me, with that experience so near at hand, that we would even contemplate because of some perceived short-term benefit that it's worth taking that kind of risk again.

Senator BENTSEN. Mr. Melaas, I would assume you would agree with me that where these kinds of jobs are lost and you have people with many productive years hopefully left for them, that somewhere some help has to come in retraining. What do you think the answer is? Where do you think the help should come from? Should it be a government program? Should it be the employers trying to provide that kind of assistance? The European nations and the Japanese have been very aggressive in retraining people, not wanting to lose that asset, helping them to remain productive. What should we do? The administration tried to kill one of the programs, the trade adjustment program. Frankly, it didn't work that well. They are targeting the other one, JTPA for a 50 percent cut. What do we do?

Mr. MELAAS. That indeed is a big problem. From a personal standpoint, I was impressed by the efforts that Texaco is making in the retraining along with the unions down in the Golden Triangle.

My personal opinion is that that sort of thing should, if at all possible, be maintained in private industry. Texaco has taken a leadership role there and I would hope that if my company was faced with that option that we would also.

Senator BENTSEN. Well, gentlemen, this has been very helpful testimony on the part of each of you and I think you've built quite a case showing the depth of this problem; not just the immediate unemployment it's created, but what it means for the future security of the Nation. I am most appreciative.

Thank you very much for your attendance this morning.

[Whereupon, at 11:40 a.m., the subcommittee adjourned, subject to the call of the Chair.]

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